VOLUME 40
NUMBER 5

MAY, 1953

plating

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See Contents Page 467

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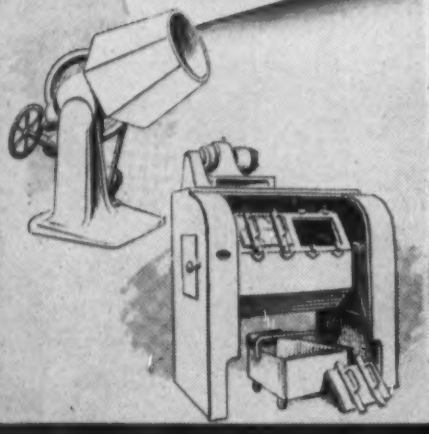

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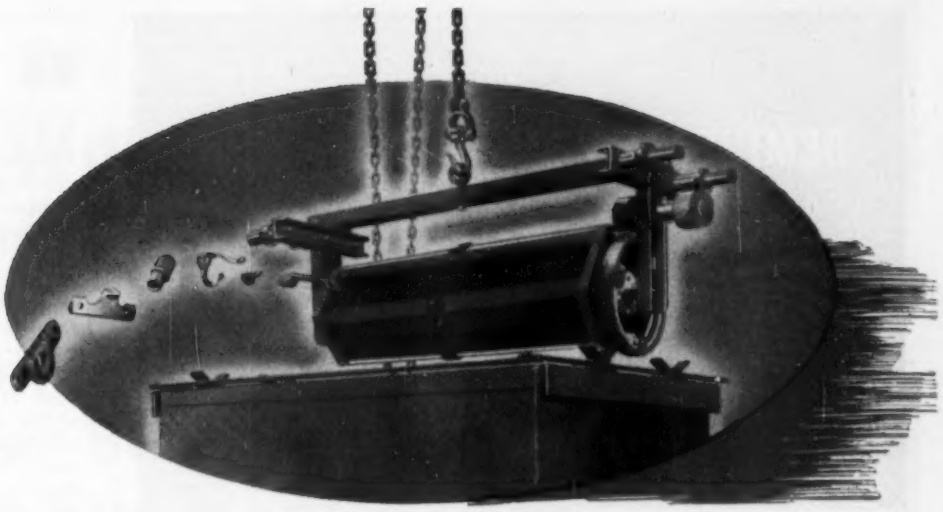

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In This Issue

Influence of Operating Variables on Composition of Electroplated Lead-Tin Alloys By A. H. DuRose and D. M. Hutchison is a paper which reports data on the influence of certain operating variables on the composition of lead-tin alloys plated from fluoborate solutions. The variables investigated were current density, lead-tin ratio, total metal content and addition agent content. Data are presented in the form of four tables and fifteen figures. An electrolytic method for the determination of the alloy composition that was tested in connection with the project is also detailed.

A Report on Japanese Electroplating Practice by Ezra A. Blount is an exceptionally well illustrated story depicting the state of development of Japanese electroplating practice. The author reports in detail on certain Japanese processes that are not used in the United States, including: chromium plating at room temperature, Daniell cell copper plating and oxalic acid anodizing. Eight references with 16 photographs complete the paper.

A. E. S.—For Electroplaters or Metal Finishers? by Leonard Weeg is a graphic analysis by the author of the objectives of the Society in which he cites specific figures in support of his plea that the Society fill the needs of all branches of metal finishing.

Cleaning and Preparation of Metals for Electroplating. VI. Sensitivity of Degreasing Evaluation Tests by Henry B. Linford and Edward B. Saubestre is another report from A. E. S. Research Project No. 12. The report compares the sensitivities of various degreasing evaluation tests when oil residues are present as uniform films as follows: atomizer > spray-pattern (water-break) > fluorescent dye > potassium ferrocyanide paper and copper sulfate dip. The paper is published in two parts, part one in this issue, part two in the June issue. The first section is illustrated with three figures and thirteen tables.

For page numbers, see Table of Contents, page 467

Published monthly at 5800 N. Marvine St., Philadelphia 41, Pa. Entered as second class matter July 1, 1946, at the Post Office at Philadelphia, Pa., under Act of August 24, 1916. Subscriptions: Domestic and Canada, $4.00 for 1 year, $7.00 for 2 years 50c per copy; Foreign, $8.00 per year, $1.00 per copy

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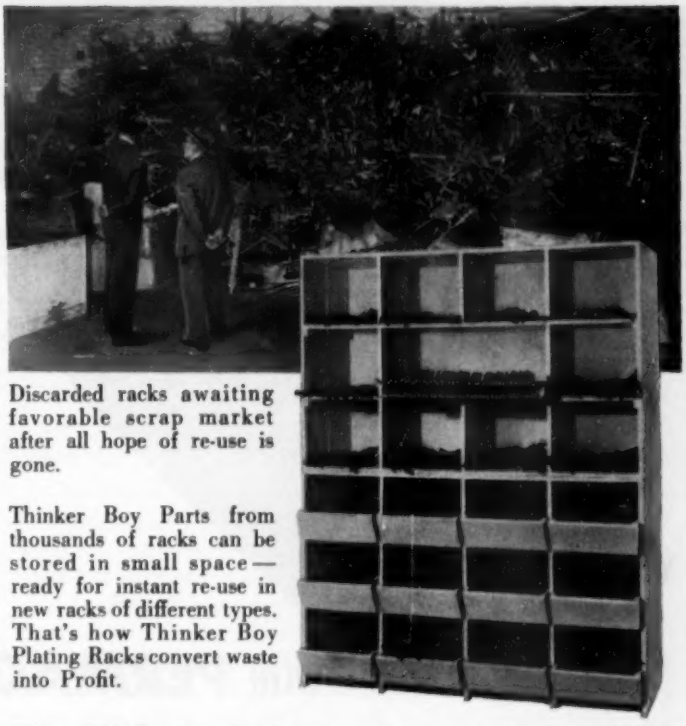

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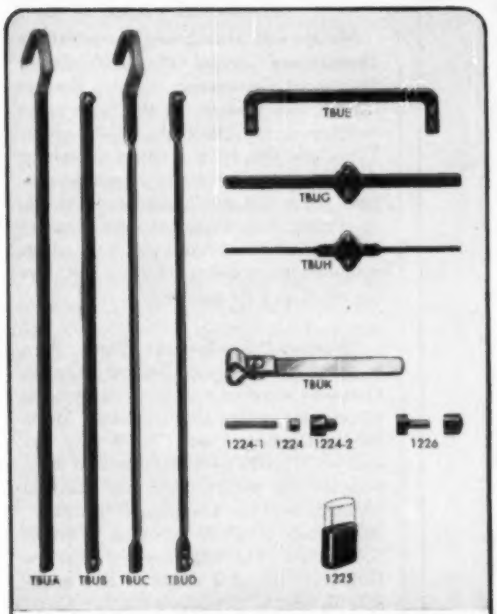

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TBUC	24, 30, 36"
TBUD	10, 12, 14, 16, 18, 20, 22, 24, 30, 36"
TBUE	6, 8, 10, 12, 14, 16, 18, 20, 22, 24"
TBUG	10, 12, 14, 16, 18, 20"
TBUH	10, 12, 14, 16, 18, 20"
TBUK	Attachable Handle—Clamps on cathode hook
1224	Tapered Stainless Steel Nut
1224-1	Stainless Steel Stud
1224-2	Plastic Cover Cap
1226	Plastic Plug for unused holes
1225	Boot—Used to cover cut end of sectional member

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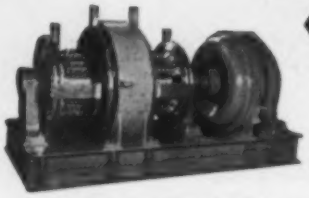

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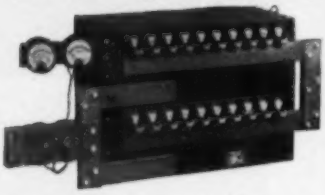

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Industry News

Bart Corporation Opens New Plant. Bart Manufacturing Corporation of Belleville, N. J., announced completion of a new building on their six-and-a-half-acre industrial tract in Newark, N. J. The new building, comprising approximately 12,000 square feet of production space, will be used exclusively for precision electroplating of heavy industrial equipment being produced for Atomic Energy Commission projects. Completion of the new plant marks the second step in the expansion program of Bart Manufacturing Corporation and affiliated companies. The first plant on the new tract was opened last spring for Bart Products, Inc. Additional buildings totaling approximately 100,000 square feet of space are contemplated for the site where activities of all of the companies will eventually be consolidated.

Metalwash Machinery Corporation Modernizes Central Office. Metalwash Machinery Corporation recently has expanded and modernized the main office building of its Elizabeth, N. J., plant. "This addition to our offices completes the first stage of a broad expansion program begun last year", announces Mr. J. L. Pettit, Vice-President and General Manager of the 27-year-old firm which manufactures washing, pickling and drying machinery for industry.

"Karbate" Equipment Films. At a recent Press Preview, National Carbon Company screened two new, fast-moving sound-color motion pictures titled "Meeting the Challenge" and "By Way of Experience", produced to describe and demonstrate the nature, uses and practical installation of the Company's "Karbate" Impervious Graphite corrosion resistant equipment. The total running time for both films, prints of which are now available on loan, is 26 minutes.

Advance Plating of Cleveland Under New Management. E. F. Durkin, who founded The Advance Plating Company of Cleveland, Ohio in 1932, and has headed it since that time, has retired

OPPORTUNITY

After 25 years as owner and operator of a successful plating plant, employing thirty men, I am getting ready to step down. I will consider experienced man to fill my place or will consider training ambitious young man who has some plating background. Salary open. *Write:*

Wm. T. Campbell
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from the presidency. **Leonard N. Elicker** is now the president of the company and **Arthur H. Losey**, vice-president. Durkin continues as director and consultant.

Mr. Elicker has been vice-president for seven years and is starting his eighteenth year with the company. Mr. Losey for the last three years has been chief process engineer for Acme Manufacturing Company of Detroit, makers of automatic polishing and buffing equipment. He has also been associated with Hammond Machinery Builders of Kalamazoo, Frederic B. Stevens Company of Detroit, and has operated a job plating shop of his own.

Clad Metal Techniques Revealed. At a recent meeting of about four hundred leading engineers, designers, and metal fabricators, Knapp Mills, Incorporated, America's largest producer of lead clad steel and lead clad copper for the chemical process industries, presented a new color motion picture entitled, "New Weapons Against Corrosion".

New Plant for Globe Compound Company, Inc. Globe Compound Company, Inc., Route 69, Wolcott, Conn., announce the completion of a new factory and office building. The modern fireproof structure affords greatly expanded facilities for production, laboratory research and technical services in the field of buffing compositions.

Robert Feigin has been engaged as technical director of the organization. He was formerly chief chemist in charge of application research, technical service and formulation at the Alrose Chemical Company, Providence, R. I.

Diversey Acquires Hawaiian Outlet. The Diversey Corporation, Chicago, has taken another step in the progressive expansion of its activities with the purchase of the Kills 'Em Chemical Company, Limited, of Honolulu, Hawaii. The new subsidiary is engaged primarily in the manufacturing of disinfectants and insecticides in the Hawaiian Islands. The modern, well equipped plant of the Kills 'Em Chemical Company, Limited, with a few additions, will be ideally suited for the manufacturing of Diversey products. With this acquisition Diversey will be the first manufacturer of food plant sanitation chemicals in the Territory of Hawaii.

New Research Laboratories Inspected by Wyandotte Chemicals Dis-

Working Partner Wanted for established Silver and Chrome Shop located in Florida. Good proposition for the right man. *Reply to:*

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There is a theory that a man who specializes in mousetraps will build better mousetraps than the one who makes merely wood or metal products. This is the narrow view of the self-conscious specialist.

Others say, "Specialists are those who know more and more about less and less," which invites the conclusion that the greatest specialist of all must be he who knows everything about nothing.

Federated believes that the hundreds of products of non-ferrous origin have a basic family resemblance, and that the more we know about all, the more we know about each. Thus lead is found with silver and antimony, and copper and tin are found with iron. These various elements and others must be separated and refined, or in some cases, discarded. Then, re-combined in different ways, sometimes alone, sometimes with other non-ferrous ingredients, they make brass, bronze and aluminum ingot; solders and type metals; die casting alloys, lead products and bearing metals; anodes for plating and for cathodic protection.

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triet Managers. Wyandotte Chemicals district sales managers recently made a half-day inspection tour of the soon-to-be-opened Research Laboratories. Equipment in the new industrial laboratories

In the group are, left to right, Robert Racine, Robert Tucker, Jack Munshaw, P. S. Spencer, M. L. Lloyd, A. J. Frieling, Andy Liger, J. L. Ramsey, W. C. Van Keuren, P. N. Burkard, W. C. Dawkins, and Ed Kubis

should be completely installed early in May. This inspecting group (one of three) was photographed in the laboratory containing an interchangeable six-stage, variable speed, power spray washer. Manufactured to unusual specifications by Metalwash Machinery Company, this 30-foot long machine can duplicate the operating cycles of nearly every metal fabricator and will handle acids, alkalies and emulsions.

New Ion Exchange Role. The practical importance of stretching our present known strategic ore reserves and making economical utilization of low-grade ore bodies or those nearing depletion was stressed in a paper delivered recently by A. B. Mindler, Permutit Company, New York, N. Y., before the technical meeting of the American Institute of Mining and Metallurgical Engineers, Inc., at the Hotel Statler, Los Angeles, Calif. In the address, "Ion Exchange in Hydrometallurgy", he stated "Ion Exchange will make possible the economic solution of the many problems in working up the progressively poorer and more complex ores which must be worked in the immediate future".

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Society News

Instrument Society of America

The Eighth National Instrument Exhibit sponsored by the Society will be held at the Sherman Hotel in Chicago, September 21–25, and will be the largest instrument show ever held.

Eighth Annual NAMF Meeting

The 8th Annual Meeting of the NAMF will be held at the Benjamin Franklin Hotel in Philadelphia on Saturday, June 13, at 7:30 P. M. Arrangements are being made for an outstanding speaker to address this meeting and discuss the subject of the International Metals Commission.

American Society of Tool Engineers

Roger F. Waindle of Muskegon, Mich., was elected president of the 25,000 member ASTE at the 21st annual meeting of the Society held recently in Detroit. Twenty-two technical papers were presented during this three-day convention which was attended by over 1,500 persons.

Masters' Electro-Plating Association, Inc.

The 35th Annual Banquet of the Masters' Electro-Plating Association, Inc., will be held at the Starlight Roof of the Waldorf-Astoria on Saturday, May 9, 1953.

Electrochemical Society

The 103rd meeting of the Electrochemical Society was held at the Statler Hotel, New York City, April 12 to 16, 1953. A total of 135 papers were presented including those sponsored by the Division of Electro-Organic Chemistry and Theoretical Electrochemistry. Dr. William Shockley of the Bell Telephone Laboratories delivered the Richards Memorial Lecture on Wednesday, the subject being, "Transistor Physics".

Hot Dip Galvanizers Association Annual Meeting

Joseph B. Tate of the Witt Cornice Company, Cincinnati, Ohio, and Frederick C. Brightly, Jr., of the Brightly Galvanized Products Company, Cicero, Ill., were presented the Thomas M. Gregory Memorial Award for the years 1951 and 1952, respectively, at the American Hot Dip Galvanizers Association Banquet as part of their 1953 Annual Meeting in Cincinnati on March 19.

I. M. F. Spring Conference

The Institute of Metal Finishing held their 1953 Spring Conference at the Hotel Majestic, Harrogate, on April 22–25. Highlights of the conference were technical sessions on Organic and Other Non-electrodeposited Coatings and Electrodeposition.

PRECOATING

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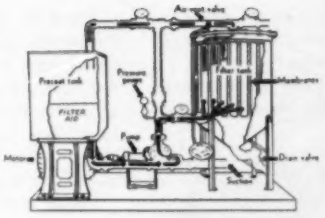

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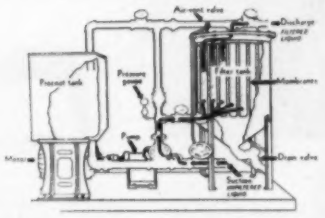

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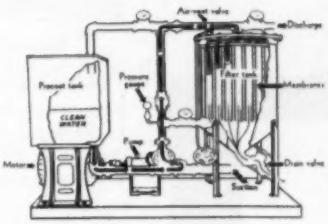
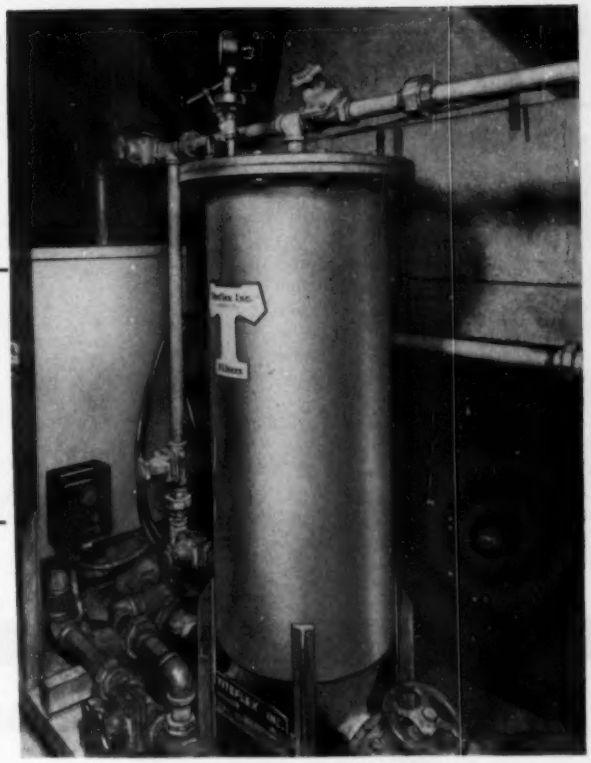
is fast . . . easy. Simple reversal of flow for backwashing at pressures up to 100 psi insures complete cake-break-up. Cleaning is complete in minutes . . . no manual removal of residue.





Titeflex filter installation in filter department at Stromberg–Carlson, Rochester, N. Y.

How Titeflex Simplicity Saves Time and Money for STROMBERG-CARLSON

Removal of anode sludge from $Zn(CN)_2$ type bath in Stromberg-Carlson's Zinc Plating operation has been no problem since they installed a Titeflex filter.

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Real economy results from Titeflex simplicity. They save time because filter can be cleaned easily, in minutes, on a daily basis. They save money because no replacement of filter-bags or other elements is needed. They save on rejections because daily cleaning results in better, more uniform plating.

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For every filtering operation large or small there is a Titeflex filter to do the job — and do it better. Capacities from 200-1000 G.P.H. up . . . filter areas from 5 to 450 square feet are available as standard construction or on special order. Find out more about Titeflex filters . . . and what they can do for you . . . today. Clip and mail the coupon for complete information without obligation.

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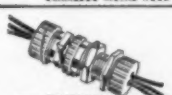

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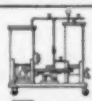

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Personals

August B. Hoefer has been elected vice-president of Udylite Corporation and vice-president and general manager of Frederic B. Stevens, Inc., a wholly owned Udylite subsidiary.

Hoefer joined the Udylite Corporation in November, 1928, after graduation from Purdue University with a degree in Chemical Engineering. He went to the New York branch in 1929, as a sales engineer and became New York district manager in 1939.

James L. Clifford has been appointed district manager of the New York Sales Office to succeed A. B. Hoefer.

Born in Long Island City, N. Y., Clifford was graduated from Brooklyn Polytechnical Institute. He joined Udylite in 1941 and has been serving as sales engineer in the New York area.

Louis J. Minbiole has been named assistant sales manager. He joined Udylite in 1946 as a sales engineer in the Michigan territory.

Hoefer

Clifford

Minbiole was graduated from Wayne University College of Engineering in 1940 and a year later was awarded a master's degree in chemical engineering from Massachusetts Institute of Technology. Prior to joining Udylite, Minbiole was associated with Buick Division of General Motors Corporation.

Frank Reha has been named sales engineer in the Michigan territory to take the position vacated by L. J. Minbiole.

Minbiole

Reha

Graduated with the degree in Chemical Engineering from Lawrence Institute of Technology, Reha joined Udylite as a chemist in 1939. First serving as field service engineer in the Michigan territory, he later joined the Indianapolis Udylite sales office as sales and service engineer.

Arthur S. Kohler has been appointed Technical Director of the Frederick Gumm Chemical Company of Kearny, N. J. He has been connected with the Company for over ten years and has served as Research Director and Chief Chemist during this time. Kohler is a graduate of Polytechnic Institute of Brooklyn, B.S. in Chemistry, 1925. He later took graduate work at Cornell and Columbia where he received an M.S. in Chemical Engineering. Prior to joining the Company, he was a professor at Newark College of Engineering for twelve years.

Kohler

L. E. Ritter has been appointed sales engineer by the F. J. Stokes Machine Company, Philadelphia, Pa., in charge of the company's new St. Louis office.

Ritter came to Stokes in 1952 from the A. Y. McDonald Company in Dubuque, Iowa. He attended Washington University in St. Louis, Mo., and Shurtleff College in Alton, Ill.

MANHATTAN RUBBER LININGS

. . . For Better Protection

Plating and pickling equipment manufacturers specify Manhattan Rubber Linings where ordinary applications do not afford adequate tank and solution protection against contamination and corrosion. Proof of the dependability and long life of Manhattan Rubber Linings is their record of giving continual, uninterrupted service for as long as 25 years or more.

Made from calendered sheets in required thickness of natural or synthetic rubber, Manhattan Linings eliminate plating "risks" . . . give longer life and more protection . . . eliminate stray currents. Every lined tank is tested to 15,000 volts to detect imperfections.

As a result of over half a century of experience in meeting the needs of equipment manufacturers, Manhattan has developed the most dependable and economical rubber linings with an exclusive rubber-to-metal bond that is inseparable.

For linings which meet your most exact requirements of economy and dependability, specify "Manhattan Rubber Linings."

RUBBER LINING PLANTS AT PASSAIC, N. J. AND NORTH CHARLESTON, S. C.

MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Manufacturers of Mechanical Rubber Products • Rubber Covered Equipment • Radiator Hose Fan Belts • Brake Linings & Blocks • Clutch Facings • Packings • Asbestos Textiles • Teflon Products • Powdered Metal Products • Abrasive & Diamond Wheels • Bowling Balls

The palm tree that grows in Ohio

They planted it a year ago.
Leading steel publications covered the story:

"New All-American Lubricant For Cold Rolling Operations"

That's how The Ironsides Company of Columbus, Ohio, announced the first successful replacement for palm oil.

Instead of relying on palm trees—half a world away, tin plate producers now have a "palm tree" right in their own back yard.

Palmoshield looks, feels and acts like palm oil; requires absolutely no changes in mill operation. Already most of the major tin plate mills in this country and Canada are using Palmoshield for regular mill operations or for production test runs.

. . . and grows and grows and grows!

Production records set with Palmoshield: Recently a leading steel company, over a run of 20 consecutive shifts, increased production 15% over the average output with imported oil. No additional investment, no increase in manpower, and no changes in mill operation. Yet 115 tons of steel were rolled for every 110 before. One company broke the single-shift record, and still another broke both 8-hour and 24-hour records.

Backed by 60 years of specialization: Palmoshield is the result of Ironsides' sixty years of specialized research in the field of scientific lubrication. For your own lubricating problems, call or write The Ironsides Company, 270 West Mound Street, Columbus, Ohio.

SPECIAL LUBRICANTS and PRESERVATIVES

SHIELD PRODUCTS

IRONSIDES
PALMOSHIELD

UDYLITE BRY-CAD

THE NEW BRIGHT CADMIUM PROCESS!

New Udylite Bry-Cad is unequalled in brightness, throwing power, plating speed and covering!

But that's not all! Bry-Cad offers exceptional operating economy, too. It is highly resistant to both organic and metallic impurities. New Udylite Bry-Cad provides high cathode efficiency and operates over a wide current density range with little "gassing" and no spray. This materially reduces waste.

Complicated parts . . . deep recessed . . . intricate shapes . . . are all plated uniformly with new Bry-Cad. And only one liquid brightener is needed for the whole operation.

Have your Udylite Technical Man give you the complete story or write direct. THE UDYLITE CORPORATION, DETROIT 11, MICHIGAN. *West of Rockies, L. H. Butcher Co., Los Angeles 23, California.*

PIONEER OF A BETTER WAY IN PLATING

THE Udylite CORPORATION
DETROIT 11, MICHIGAN

Udylite

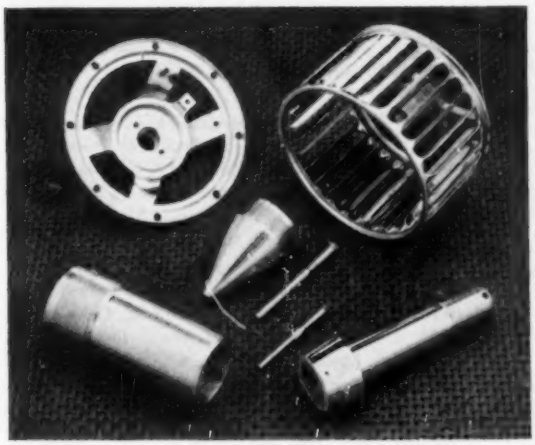
LABORATORY CONTROL MAKES THE DIFFERENCE!

In *cadmium plating*, good results, time after time, are due to tested supplies and ingredients. Quality must never vary. That's where Udylite thoroughness pays off!

"Uniformity through laboratory control" is the keynote of all Udylite supplies. For example, check these materials used with new Udylite BRY-CAD:

- The unvarying purity of Cadmium Ball Anodes—which Udylite originated—is an example of Udylite uniform quality. All anodes are spot-checked to maintain uniformity of size, content and weight.
- Udylite Ball Anode containers are designed to use anodes to the last ounce—as well as maintain maximum anode area.
- Udylite Cadmium Salt #153 contains all basic components of the cadmium bath. You can be sure that the chemicals used are finest quality . . . and mixed in EXACT proportions for best results.
- Udylite Brightener #53 used in the BRY-CAD Process results from years of laboratory research.

Note various items of intricate shape plated with the new Udylite BRY-CAD.



So . . . for best results . . . for uniformity in plating on YOUR jobs . . . choose Udylite anodes, containers, materials. Call your Udylite technical man or write direct for complete lists of supplies. THE UDYLITE CORPORATION—DETROIT 11, MICHIGAN. *West of Rockies, L. H. Butcher Co., Los Angeles 23, California.*

PIONEER OF A BETTER WAY IN PLATING

THE Udylite CORPORATION
DETROIT 11, MICHIGAN

Personals

Roger N. Perry, Jr., has recently returned to Norton Company's Public Relations department, following two years' active duty with the U. S. Navy. He is now responsible for the department's technical service section which includes all contacts with the technical press.

Eduardo R. Redlhammer has been appointed vice-president in charge of the Sel-Rex Rectifier Division, and **Sid Mitwol** as Sales Manager of the same division of Bart-Messing Corporation. Redlhammer has been associated with the company since 1947. He was formerly chief engineer in charge of rectifier development. Prior to joining Bart-Messing Corporation, the new vice-president studied Electrical Engineering at Penn State, and pioneered many new developments in the rectifier industry.

Mitwol, as sales manager of the Sel-Rex Rectifier Division, will direct the

Redlhammer Mitwol

activities of an expanded sales organization for the division. Prior to joining Bart-Messing Corporation four years ago, he received his B.S. degree in Electrical Engineering at C. C. N. Y. and was associated with Federal Telephone and Radio Corporation, and Radio Receptor Corporation.

Harold E. Cleaves has retired as chief of the Chemical Metallurgy Section after 26 years of service at the National Bureau of Standards. He entered the Chemistry Division in 1912 and left the Bureau in 1916, returning as a member of the staff of the Metallurgy Division in 1930. He was appointed chief of the Chemical Metallurgy Section in 1946.

A. R. McNeil has been appointed New England Sales Manager of MacDermid, Incorporated. For the past nine years, Art has been Bridgeport Sales Service Representative for MacDermid, Incorporated. Mr. McNeil is active in the American Electroplaters' Society, having held every office in the local Branch.

McNeil

Richard Nyquist of the Sales Laboratory has joined the field force as Sales Service Representative. He is a graduate of Michigan State College and was in the Sales Laboratory in Waterbury for three years.

Allen Ferguson, former Chief Chemist of Electrolux Corporation, Old Greenwich, Conn., has joined the MacDermid Sales Service Laboratory. Ferguson is a graduate of Baltimore City College.

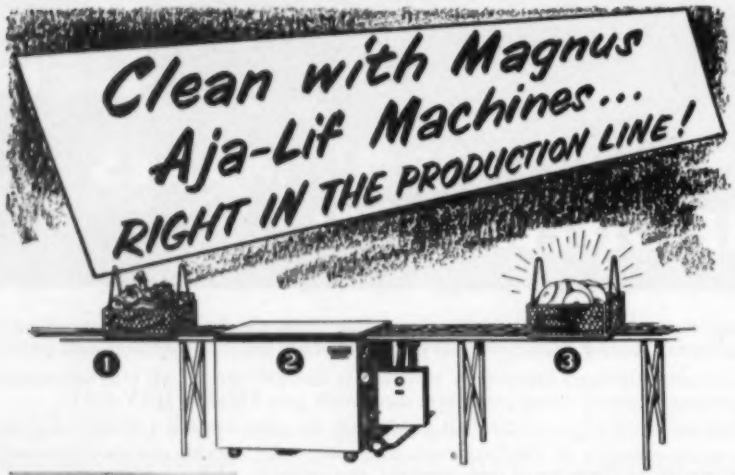
Gilbert B. Valentine has been appointed Sales Manager of Technical Processes for Promat Division, Poor & Company, Waukegan, Ill. He was formerly employed by Wagner Brothers, Inc., McGean Chemical Company and Westinghouse.

Valentine received both his Bachelor's and Master's degrees in Chemical Engineering from Case Institute, Cleveland.

William F. Mooney, formerly with Mackley Products, has been appointed Sales Manager of Industrial Products. Mooney received his B.S. degree in Chemical Engineering from San Francisco University.

Charles J. Davoli has been made Eastern Service Manager, working out of the office of Reynolds-Robson Supply Company, Philadelphia.

He received his Bachelor of Science de-



AJA-LIF IN PRODUCTION LINE. Work is loaded and unloaded at top of machine. 1—Dirty parts from processing; 2—Cleaning in Aja-Lif; 3—Cleaned parts to finishing.

Magnus Aja-Lif Cleaning Machines bring you all the advantages of speed and thoroughness of the Magnus Aja-Dip principle of metal cleaning. Added to the chemical action of the cleaning solution is the vigorous and effective mechanical scouring and shearing action obtained while the work is moved up and down in the solution 90-180 times a minute.

***In addition,* with the Aja-Lif Machine, you load the work on the machine at waist level. When you press the starting button, the platform drops as the cover closes, and agitation starts. When ready to unload, the machine stops and the platform returns to waist level. The machine fits perfectly into the production line!**

COMPRESSED AIR OPERATED . . . no gears, speed reducers or belts. No motors or electrical connections. Heating source to meet your needs.

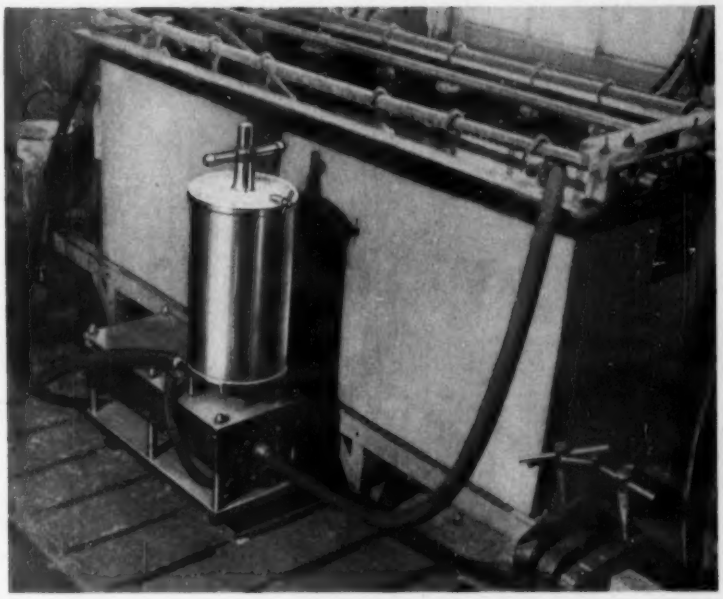
WRITE FOR BULLETIN AL-701, containing the complete story on this unique metal cleaning machine.

magnus

MAGNUS CHEMICAL CO., INC.
41 South Ave., Garwood, N. J.
In Canada: Magnus Chemicals, Ltd., Montreal
Service Representatives in Principal Cities

Here's how to cut your losses

get better finished plated work — save time and labor



The "Sealed-Disc" Filter will remove all dirt, dust, and sludge from your plating solutions. You'll no longer worry about pitting, spotting, poor adhesion, formation or nodules, etc.

More and more platers testify to the remarkable savings in operating time and labor that the "Sealed-Disc" Filter gives them. These cost-minded platers get better finished plated work and have found that their solutions last longer. "Sealed-Disc" Filters, designed to meet plating room requirements, are smaller, more compact and portable, than ordinary conventional filters.

Regardless of the size or type of your installation, there's a "Sealed-Disc" Filter to "fit your job." You can depend on a "Sealed-Disc" Filter for positive, trouble-free performance that's proof against even the invisible impurities that cause nodules and porousness, proof against losses caused by rejects and reworking. Write for complete details or contact your regular plating supplier.

ALSOP
ENGINEERING CORPORATION
805 Fine Street Milldale, Connecticut

Other Alsop Plating Room Equipment

We manufacture a full line of Mixers and Agitators covering a complete range of sizes, for mixing, blending, and dissolving. Stainless Steel Mixing Tanks are also available in a wide range of capacities. For full details and illustrations write for your free catalog.

It means

Money in your pocket ! ! !

when you Specify Dependable

HYSOL

No. 3401 and No. 3801

COATINGS

for Racks, Tanks and Ducts

at new low prices!

The same high quality Hysol rack, tank and duct coatings—proved in service for over three years—are now available at *New Low Prices*. Increased production efficiency has enabled us to reduce costs and pass savings along to you—from 17% to 22%, depending upon quantity ordered.

Hysol No. 3401 and No. 3801 Coatings

- Protect against chemical attack in plating operations
- Reduce solution drag out losses
- Provide fast coating by your own personnel and equipment
- Reduce current losses by up to ⅓.

Take advantage of these dependable Hysol coatings. Write, phone or wire your order today.

houghton laboratories, inc. OLEAN, NEW YORK

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 516.

Personals

gree in Chemistry from the University of Miami, Oxford, Ohio and his Master's degree from the University of Pennsylvania.

Kenneth W. Clayton, Thomas S. O'Donoghue and **Richard O. Watson** have recently been added to the Industrial Service staff of Wyandotte Chemicals Corporation. Clayton will headquarter at Wyandotte's Los Angeles plant, O'Donoghue at the company's Chicago office and Watson at Wyandotte's Detroit Office.

Clayton

O'Donoghue

Clayton is a native Californian and has studied chemical engineering at Oklahoma A. & M. and at the University of California, and was associated with Fabricated Metals of Oakland.

Watson

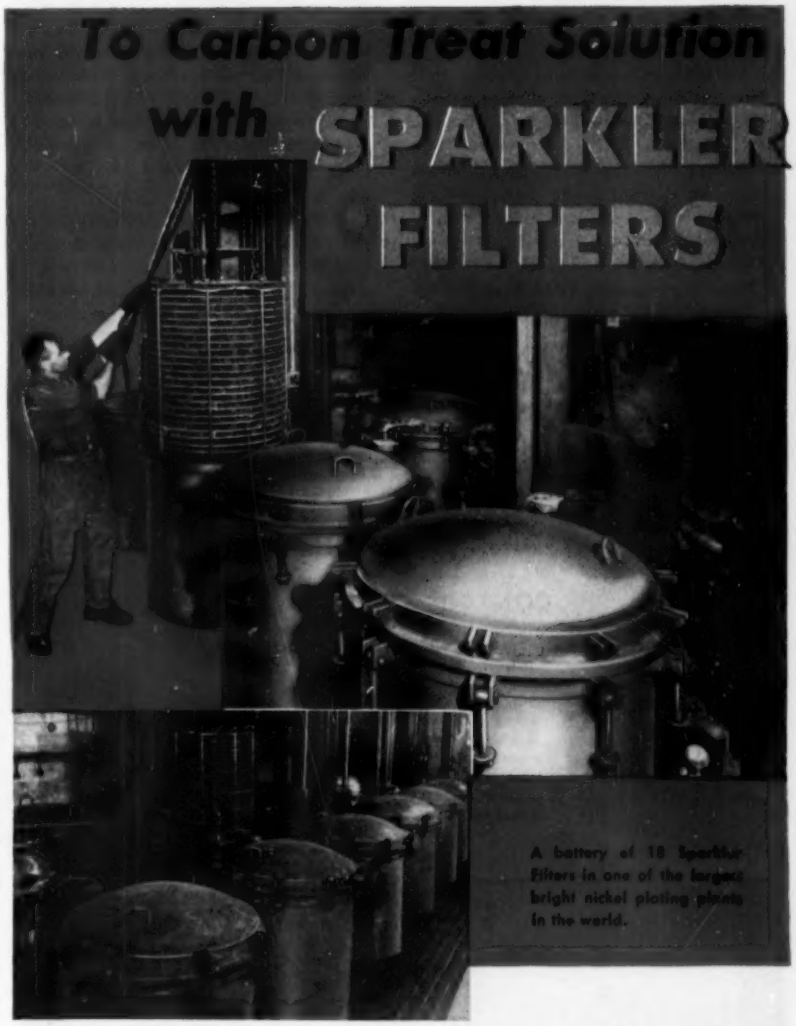
Fulton

O'Donoghue received his technical training at Notre Dame, Northwestern and Loyola Universities, and had sales and merchandising experience with U. S. Rubber Company.

Watson is a graduate of the University of Detroit and was employed as a process engineer by Wyandotte. For the past year he has been in charge of one of Wyandotte Chemicals' Technical Service laboratories.

Harold F. Fulton recently joined the staff of the Buffalo Office and will service Empire State industrial customers, except in greater New York City, and in the Erie, Pa., area. Fulton is a graduate of Miami University of Oxford, Ohio. His experience in the metal industries includes supervision of a heat treating and pickling department in a major steel mill, and six years of industrial sales and service work in Upper New York State.

NO SHUT DOWN



A battery of 18 Sparkler Filters in one of the largest bright nickel plating plants in the world.

Carbon treatment without shut down is accomplished by cutting out one or two units in a battery of filters, removing the cartridge assembly of filter plates, and replacing with a new plate cartridge dressed with clean filter paper. The proper amount of carbon is mixed with water in a standby tank and recirculated through the filter thus depositing the carbon on the new plates in a cake of uniform thickness and density. The solution requiring a carbon treatment is then circulated through the carbon beds giving the plating solution the carbon treatment without contaminating the tank or stopping plating operations.

The quick change feature of the plate cartridge in Sparkler filters permits replacing a set of plates in a matter of minutes. Production can be resumed without appreciable interruption.

Sparkler Horizontal Plate Filters give absolutely sharp filtration at all stages of the cycle.

SPARKLER MANUFACTURING CO.
Mundelein, Illinois

SPARKLER horizontal plate FILTERS

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 517.

Albert H. Clem has been appointed General Sales Manager of the Pennsylvania Salt Manufacturing Company, filling the position left vacant by the recent death of **Russell S. Roeller.** Before this appointment, Clem was Assistant General Sales Manager. He joined Pennsalt in 1938 following his graduation from the Pennsylvania State College with the degree of Bachelor of Science in Chemical Engineering.

Burtron Zook has been appointed Sales Manager for Jensen Specialties, Inc., Detroit, Mich.

Zook served with Jensen as a sales engineer for the last seven years. He has 17 years' experience in industrial sales engineering, the last 13 of which have been in the infra-red heating field.

Paul H. Goodell, Sales Manager for three years, will be retained in a consulting capacity on engineering and development problems.

Arthur N. Sudduth has been named manager of the new abrasive division of Whittaker, Clark & Daniels, Inc. He will supervise the sales and production of a wide variety of abrasives for the finishing of metals, glass, silver, plastic and for wood finishing. Mr. Sudduth brings with him long and valuable experience in the field of abrasives with special knowledge on pumice from his previous connection of 37 years with Jas. H. Rhodes & Company, Chicago and New York City.

Dr. W. A. Thomas has been appointed Chief Engineer by The Electric Products Company, Cleveland, Ohio and will be responsible for all electrical and mechanical design engineering, development and research. He was formerly Manager of Electrical Engineering. **E. D. Smith** is now Consulting Engineer and will be responsible for assigned engineering products requiring highly specialized investigation and development. **J. J. Unger** becomes Manager of Electrical Engineering and will be responsible for all electrical design activities. **J. R. Williams,** formerly the Central Planning Manager, has been appointed Manufacturing Manager and will be responsible for all production, production and inventory control and industrial engineering. **R. H. Worby** has been appointed Chief Industrial Engineer and will be responsible for methods, tools, plant layout, materials handling, plant engineering and maintenance.

Dr. Ralph A. Schaefer has become vice-president in charge of materials development at Clevite-Brush Development Company. Schaefer has been director of research at The Cleveland Graphite Bronze Company, which like Clevite-Brush is a unit in the Clevite group of companies.

Schaefer

Dr. Schaefer first joined Cleveland Graphite in 1936 as a research chemist, and has done advanced work in electroplating and powdered metallurgy and their allied fields. He is a vice-president of the American Electroplaters' Society, and has been active in the Electrochemical Society and the American Society of Testing Materials.

Robert W. Jeffery has been appointed as General Sales Manager of the Currier Company, Oakland 4, Calif.

Formerly Manager of infra-red sales for Fostoria Pressed Steel Corporation of Fostoria, Ohio, Jeffery is a graduate of Carnegie Institute of Technology and a registered engineer.

Roland W. Saxton has been appointed Sales Manager of the Contract Division of Kold-Hold Manufacturing Company, Lansing, Mich.

For the past six years "Bob" Saxton has been District Sales Supervisor for the U. S. Gypsum Company of Chicago.

H. C. Schlaupitz has been appointed Director of Research of R. Wallace and Sons Manufacturing Company, Wallingford, Conn.

A FEW OF THE MANY
FORMAX
PRODUCTS

STYLE C-20
CONTACT WHEELS
and F-26 Belt Lubricant

A C-20 flexible Contact Wheel will form itself to the shape of the work and permit the abrasive felt to polish contoured surfaces and F-26 Abrasive Belt Lubricant will increase belt life by preventing loading and glazing. Produces finer, smoother and brighter surfaces through lubrication.

ZIPPO BUFFS

These famous long-wearing buffs run cool under all buffing conditions. Constructed of high count bias-cut cloth or sisal mounted on safe steel centers. Available in a wide range of densities and center diameters.

A complete line of buffing compounds in bar form as well as in liquid form for brush or spray application. Also Flex-A-Glu polishing wheel cements.

Our Laboratory and Sales Engineering staff would welcome the opportunity to be of help in solving your finishing problems.

Send for descriptive literature

FORMAX MFG. CORP.
DETROIT 7, MICHIGAN
"THE FOUR McALEERS"

MANUFACTURED IN CANADA BY JOHN GALLOWAY LTD., KITCHENER, ONT.

He graduated from Carnegie Institute of Technology with a B.S. degree in metallurgical engineering in 1943, received a Master of Engineering degree in metallurgy from Yale in 1951, and is now working for a Doctor of Engineering degree at Yale.

He has held positions as research metallurgist for The Aluminum Company of America, chief chemical engineer for The Napier Company, and since 1946, research engineer for R. Wallace and Sons Manufacturing Company.

Robert H. Allgood has been appointed director of public relations for the industrial and drycleaning divisions of Detrex Corporation of Detroit, Mich.

Allgood

Allgood, a native Detroiter, came to Detrex from Hixson & Jorgensen, Inc., Los Angeles, national advertising agency, where he was an account executive. Before joining that organization he was with the Westinghouse Electric Supply Company in Vernon, Calif., and the SMA Company, Inc., Chicago.

Bert Hawhee, who for the past 15 years has been associated with leading plating manufacturers, has been appointed sales

Hawhee

representative by Wagner Brothers, Inc., Detroit, Mich., for their Indiana territory. He will locate in the newly established office at 3016 N. Illinois St., Indianapolis, Ind., and will handle the entire Wagner line of plating and polishing supplies and equipment.

Eugene B. Hotchkiss has been elected Chairman of the Board of The Cro-Plate Company, Inc., Hartford, Conn. Mr. Hotchkiss has been a Director of the Company since 1949.

Obituaries

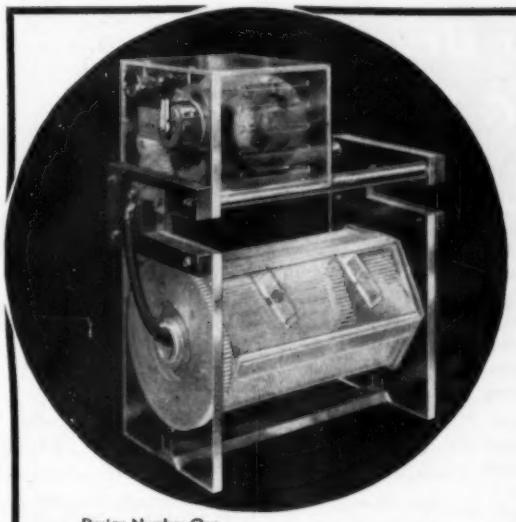
✣ **Edward S. Bassett,** 83, former President and Director of Cowles Chemical Company, died March 9 at his home in Cleveland Heights, Ohio. Mr. Bassett was born in New Haven, Conn., and had been associated with Cowles since 1918 when he became a Director. In 1926 he was appointed General Manager, and in 1930 was elected President, serving in that office until 1938. At that time he became Chairman of the Board and served until 1941 when he retired from that office but retained his membership on the Board and continued to serve the company as Secretary.

He is survived by his wife, a daughter, and his son, Charles C. Bassett, Vice-President and Director of Sales for Cowles.

✣ **John W. English** was claimed by death on March 9, 1953 after having suffered a stroke. A member and officer of the New Haven Branch, A. E. S., Mr. English was employed as a salesman by the Wyandotte Chemical Corporation for 33 years and prior to that time was employed by the R. N. Bassett Company, Shelton, Conn.

✣ **Jacob Hay,** 64, a leader in the Chicago electroplating industry, died while vacationing in Hollywood, Fla.

He was president of the Chicago Branch of the American Electroplaters' Society in 1926. In 1935 he founded the Jacob Hay Company and in 1943, the Plating Service Company. He leaves his widow, Josephine; five daughters and a son, Lawrence J., chairman of the Chicago Electroplaters' Institute.



The STUTZ Portable Plating Barrel

Design Number One
Cylinder suspended and rotated between heavy side frames designed to serve as a stand support. Side frames are firmly fixed and further braced with a bottom tie bar thereby providing rigid bearing stability.

THE STUTZ PORTABLE PLATING BARREL is designed and constructed of High Temperature Lucite to provide continuous processing of piece parts through the operations of Akali Cleaning, Water Rinsing, Acid Treatment and Plating. Progression through these operations is made by manual handling or if necessary with the assist of an overhead traveling hoist. (Hoist attachment available.) The Stutz Portable Plating Barrel is made in 2 sizes with cylinders having inside dimensions of 6" x 12" and 8" x 18". Cylinder can be partitioned. Also 3" or 4" diameter cylinder can be supplied. Standard perforations are 3/32". Smaller or larger openings can be furnished as required. All gears are of 1/2" High Temperature Lucite. Operating temperature up to 185° F.

Write for Our New Illustrated Literature Showing This and Other Design Arrangements

Manufactured by:

GEORGE A. STUTZ MANUFACTURING COMPANY

1639-1647 Carroll Avenue **Chicago 12, Illinois**

"Complete metal finishing equipment and supplies"

Trade Literature

L—500. Metal Finishing Catalog—A new catalog containing factual information on the surface preparation of all base metals for any type of finishing has been announced by Frederick Gumm Chemical Company, Inc. This catalog shows complete Clepo cleaning cycles for various electroplating applications; also included are sections on Clepo deburring and burnishing methods, and the treatment of aluminum with Clepo aluminum compounds. There is also a supplement on plating solution analytical procedures. For your copy of this catalog use Reader Service Card.

L—501. "Mylar" Polyester Film Properties Bulletin—A new technical bulletin containing up-to-date information on the physical, electrical, and chemical properties of "Mylar" polyester film, and suggested applications, has been issued by the du Pont Film Department.

First of a series to be issued on "Mylar", the new bulletin runs 14 pages, complete with charts, diagrams, and tables. "Mylar", one of the newest products of du Pont research, is now being produced only in limited quantities for market development purposes. The bulletin also suggests that the following applications be explored:

Electrical—tape insulation for motor and generator field coils; and non-electrical—a base for pressure sensitive, electrical, and industrial tapes; liners for steel and fiber drums; protective covers for precision machinery, instruments, and a base for vacuum metalizing with aluminum, zinc, and silver.

Copies of the new technical bulletin on "Mylar" (No. 1-2-53) may be obtained by use of Reader Service Card.

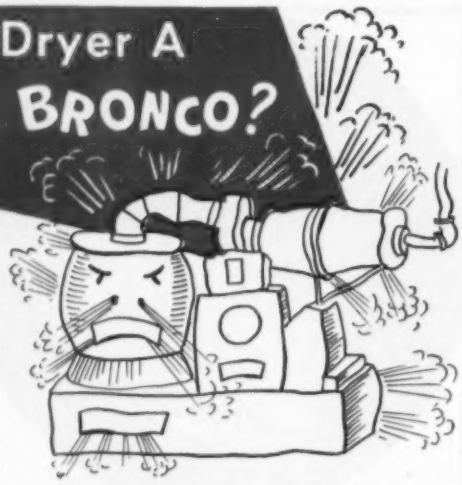
L—502. Wyandotte Booklet on Floor Safety—A 16-page, illustrated booklet on floor absorbents and the maintenance of safe floors in industrial plants has recently

been issued by Wyandotte Chemicals Corporation. Featured in the booklet are practical instructions and photographs of actual use of floor absorbents in several kinds of industries. Copies of this Wyandotte Zorball booklet may be obtained without charge by writing: Industrial Sales Department, Wyandotte Chemicals Corporation, Wyandotte, Mich., or by using Reader Service Card.

L—503. Electrodeposition of Hard Nickel—A 16 page reprint by The International Nickel Company, Inc., illustrated with photo-micrographs, charts and tables, covers deposits of a hardness of 380 to 480 Vickers, in thickness and quality suited to industrial and engineering applications. Heavy deposits can be made, free from laminations, sound in structure and of a high order tensile strength (157,000 psi) coupled with measurable ductility (6 per cent). A nickel sulfate electrolyte containing ammonium salts and boric acid is used. High current efficiency, good throwing power and a high rate of deposition are attainable, and these advantages reduce the cost of heavy nickel deposits. For your copy use Reader Service Card.

L—504. Tapecoat Guide to Combat Corrosion—A new illustrated brochure designed to help solve corrosion problems has just been released by the Tapecoat Company, 1523P Lyons St., Evanston, Ill. Based on the company's experience in serving the water and sewage and chemical and industrial applications, the brochure presents practical suggestions to combat corrosion. It includes details on how and where coal tar protection can be used to best advantage and offers case histories to show how corrosive problems have been overcome in many fields.

Is Your Dryer A BUCKING BRONCO?



In order for a centrifugal dryer to stay put it should be heavy. That's why the modern Nobles Dryer is about twice the weight of most dryers. Extra weight is one of the reasons for its stability, its freedom from vibration, its smooth operation, and long trouble-free life.

It's all new in design and principle. A powerful suction fan *draws* the air completely through this modern Nobles Dryer and exhausts it at the bottom! Electric or steam heaters are mounted in the cover of this machine of advanced design for a saving of space and elimination of heat loss.

Air moving equipment isn't an extra. The powerful suction fan is an integral design feature of each machine. A brake pedal extending around the entire work area controls an internal, expanding hydraulic brake for quick, smooth stops.

Why not take the first step now toward modern quick drying and lowest costs?

NOBLES ENGINEERING & MANUFACTURING CO.

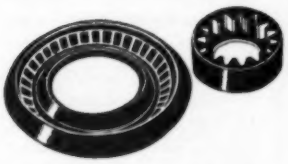
ST. PAUL 6, MINNESOTA

Write Today for the FREE NOBLES DRYER BROCHURE

AMAZING TENSILE STRENGTH

PERMANENT FLEXIBILITY

CONTINUOUS ADHESION



RUGGED SCUFF RESISTANCE

POSITIVE INSULATION

DURABLE PROTECTION

When...

THEY'RE MICCROSOL COATED

They Meet the Highest Industrial Standards

MICCROSOL E-1003 Heat-Cured Rack Coating is a 100% solids, non-evaporating material that produces a smooth, tough, leather-like coating which will often outlast the rack. Exceptional adhesion is achieved through the use of our primers.

In addition to the outstanding characteristics listed above, tests for abrasion and resistance to all commonly used plating solutions, acids, and caustics show superior performance in comparison to similar products. MICCROSOL E-1003 has proven to excell as a coating for materials-handling equipment, baskets, hangers, and a wide variety of plating equipment parts.

MICCROSOL E-1003 has an exceptionally high gloss, allowing free drainage, and no solution carry-over.

We will be pleased to help you with your coating problems. Send us full particulars.

MICCRO Products

MICHIGAN CHROME

and Chemical Company

8611 Grinnell Avenue • Detroit 13, Michigan

chromium chemicals bearing
this trademark
are preferred
by leaders
in the metal
finishing industry

MUTUAL CHEMICAL CO. OF AMERICA
MUTUAL
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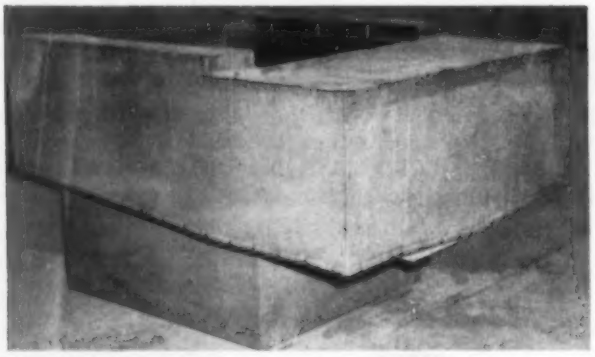


Rubber linings steam pressure vulcanized to inside and outside surfaces of your tanks protect them against corrosive acid attack. In turn, the lining on this tank is protected against early deterioration by the STORTS welding specification, which assures a smooth, solid, sound substructure—welded for keeps.

42 STONE STREET STORTS WELDING COMPANY INCORPORATED MERIDEN, CONN

Manufacturers of Welded Fabrications to Specification

Trade Literature

A copy of this helpful guide can be obtained through use of Reader Service Card.

L—505. Tin Data Sheet—The Flowing (brightening) of Electrodeposited Tin is the subject of a new data sheet No. 120 released by the Chemical Division of Metal & Thermit Corporation, 100 E. 42nd St., New York 17, N. Y. The entire process, equipment and solutions are described. Common difficulties and their corrections are also discussed. For your copy use Reader Service Card.

L—506. Demineralizer Data Bulletin—Penfield Manufacturing Company, Inc., 19 High School Ave., Meriden, Conn., has recently issued a new catalog sheet which describes a new fully automatic monocolumn demineralizer. The bulletin includes a diagram along with a detailed description of parts, sample specifications and performance data to provide a quick, concise and complete resume of all essential information. The special feature of the new MA Model described in the bulletin is the completely automatic performance of all functions, including the regeneration cycle. For copies of this new Penfield MA Model Catalog Sheet P-1 use Reader Service Card.

L—507. Formbrite Booklet—A 12-page booklet on "Formbrite" has been released by The American Brass Company. "Formbrite" is metal which is stronger, harder and springier than the usual drawing brasses, yet retains remarkable ductility for forming and drawing and takes sharp, clean-cut ornamental die impressions. It is said to have a surface superior to ordinary drawing brass and was developed for applications where the metal is to be formed or drawn into products on which finishing is an important cost factor. The publication lists physical properties, and contains helpful information on pressroom and finishing room procedures. For your copy of Booklet B-39-2 write American Brass Company, Waterbury 20, Conn., or use Reader Service Card.

L—508. Metal Cleaning Catalog—A new catalog on industrial chemicals and processes is announced by Whitfield Chemical Company, 14227 Schaefer Highway, Detroit 27, Mich. This illustrated catalog contains complete data on cleaning of metal surfaces and assemblies, preparation for painting, and stripping organic finishes. It describes in detail the various processes used for (1) removal of paint coatings from rejected parts and work hangers, (2) removal of oil, grease,

buffing compound, drawing compound, abrasives, chips, before painting, plating, assembly, etc., (3) removal of oil, rust, and scales; formation of rust inhibiting phosphate coating before painting, (4) industrial maintenance and cleaning for repair. For your copy of this catalog use Reader Service Card.

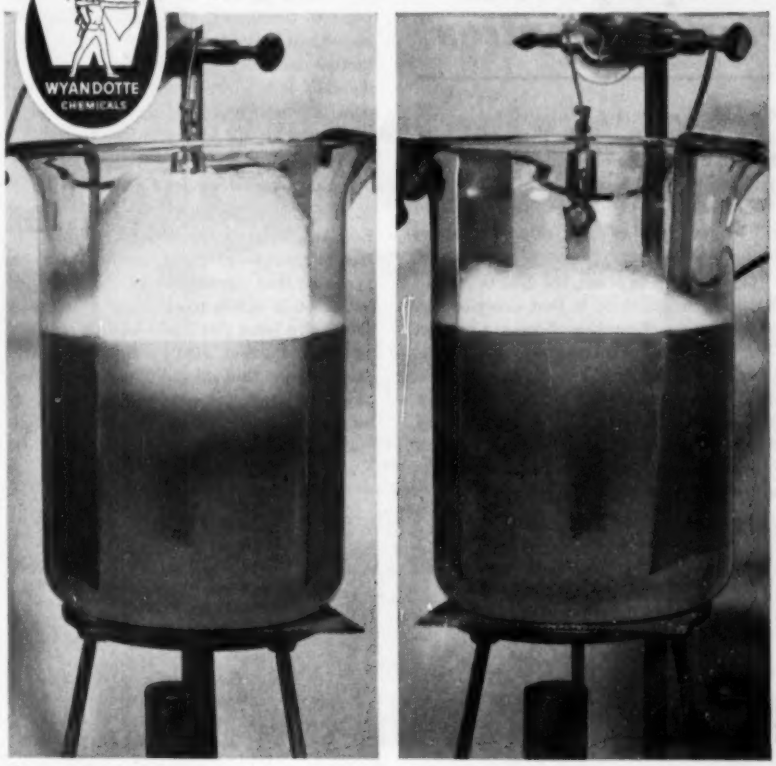
L—509. Rectifier Brochure—A free brochure explaining the application of rectifiers to various operations has just been made available by the American Rectifier Corporation, 95 Lafayette St., New York 13, N. Y. In the course of placing its products throughout the country, the company has taken note of questions most frequently asked and has now compiled them, with their replies, in an interesting question-and-answer folder that reveals the many benefits of keeping d-c equipment working on a-c while retaining d-c speed control. For your copy of this brochure use Reader Service Card.

L—510. Welded Steel Tubing—The Nikob Tube Company, 5002 S. Whipple, Chicago 32, Ill., have just released a new 38-page booklet which details a bird's-eye-view of the Company, showing various operations in the production of electric welded steel tubing and conduit. Listed are typical innumerable product applications which can be made efficiently and economically from tubing. Also included are seven pages of data and reference material; hardness conversion, fraction equivalents, tolerance tables, etc. For your copy of this informative booklet use Reader Service Card.

L—511. Metals Chart—An unusual metals chart, 16 by 34 inches, showing the compositions of all commonly used metals and alloys in industry, has been prepared by Sam Tour & Company, Inc., 44 Trinity Place, New York 6, N. Y. The chart lists the constituent elements and the percentage composition ranges for 60 different classes or types of metals. Also shown is the atomic number and specific gravity of each of the 48 elements commonly encountered in industrial metals. For your copy of this unique chart use Reader Service Card.

L—512. Finishes for Aluminum—Reynolds Metals "Technical Advisor" Number 20, just published, has a lead feature article devoted to stretch forming, and carries the second article in a new series on "Finishes for Aluminum", taken from Reynolds technical manual on this subject. Also featured in this issue is the amazing new method of welding aluminum without heat. This "cold" welding process is explained and three typical welds in aluminum are shown. For your copy of this literature write to Reynolds Metals Company, 2502 S. 3rd St., Louisville 1, Ky., or use Reader Service Card.

Specialists in Industrial Cleaning Products



Comparative foaming test. At left, Wyandotte F.S., prior to latest formula improvement, has average foaming characteristics for a heavy-duty electrocleaner used at a high current density. At right, in the same test at the same high current density, foaming of improved F.S. is greatly reduced. This minimizes explosion possibilities in high-conductivity electrocleaners, as well as problems due to excessive foam carried out on parts.

Improved Wyandotte electrocleaners are non-dusty and cut foam formation 50%!

Now Wyandotte's three great electrocleaners, F.S., B.N. and No. 90 are even better than ever!

Excellent performance characteristics of all three are unchanged! Dustlessness minimizes coughing, sneezing, skin irritation — foam is reduced as much as 50%!

For better electrocleaning at lower cost, use the best electrocleaners on the market: F.S.* for all around heavy-duty anodic steel cleaning: B.N. for versatile direct and/or reverse cleaning of non-ferrous metals; No. 90 for anodic steel cleaning where smuts and/or chrome contamination are particularly troublesome.

Ask your Wyandotte metal cleaning specialist to demonstrate improved F.S., B.N. or No. 90 to you. *Wyandotte Chemicals Corporation, Wyandotte, Michigan. Also Los Angeles 12, California.* * Reg. U.S. Pat. Off.

CLEANING THE WORLD

Largest manufacturers of specialized cleaning products for business and industry

Wyandotte CHEMICALS

Helpful service representatives in 138 cities in the United States and Canada

Equipment and Supplies

E—513. Protective Finish for Magnesium—Allied Research Products, Inc., Baltimore, has announced the addition of Iridite No. 15 (Mag Coat), a new protective finish for magnesium, to its line of protective finishes for zinc, cadmium, aluminum and cuprous alloys.

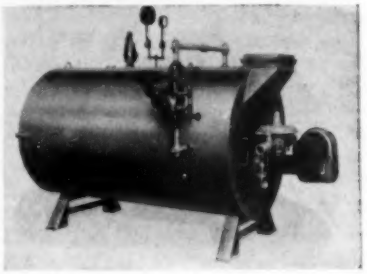
Dark brown in color, the Iridite No. 15 finish on magnesium is best described as of a complex chromium-chromate nature. The film is highly resistant to atmospheric corrosion, an integral part of the metal itself, and will not chip, flake or peel when bent. The film is produced by immersion in a solution operated at room temperatures. Immersion times vary from as few as 15 seconds to only 2 minutes, depending upon the condition of the metal prior to treatment, alloy treated, and dimensional stability required. Other protective treatments require as long as a one-half hour immersion in a high temperature bath following pre-cleaning in a similar pickle for maximum protection.

Further information may be obtained by using Reader Service Card.

E—514. Primer for Vinyl Finishes on Rusty Steel—A paint primer is now available that covers and adheres to rust, acting on it slowly to chemically and mechanically bond steel, rust and primer together. Further rusting is stopped in atmospheres that corrode steel at a slow but steady rate. It wets and changes rust but does not dissolve it in the normal sense, nor does it "pop" rust off the surface. (Heavy and loose rust naturally must be brushed off to get a proper bond through a rust formation to steel.) This primer was developed primarily to stop the peeling of polyvinyl chloride finishes from rusty steel.

For additional information on this material write to Carboline Company, 7613 Forsyth Blvd., St. Louis 5, Mo., or use Reader Service Card.

E—515. Oil-Gas Steam Boiler—Sellers Engineering Company, Chicago, recently announced the volume production of a new boiler, the Supermarine, Model LO, a combination oil and gas steam



boiler. It burns either gas or oil (No. 3 or lighter) with equal efficiency and is an advanced development of the line of twin-fuel boilers which Sellers formerly manufactured.

An internally fired marine type, it is provided with seven square feet of water backed heating surface for each boiler horsepower developed to assure a long life of peak efficiency with either fuel.

On a change over from either fuel, conversion is accomplished simply and quickly in a few minutes. According to the manufacturer, this new unit is excellent where a change over from one fuel to another is contemplated, and ideal where "emergency standby" equipment is required.

Further information may be had by writing Sellers Engineering Company, Dept. P, 4876 N. Clark St., Chicago, Ill., or by using Reader Service Card.

E—516. New Oakite Phosphatizing Material—Oakite Products, Inc., have announced the development of Oakite Crys Coat HC, a phosphatizing material which creates a complex zinc phosphate coating on steel and iron to promote excellent adhesion of paint to metal.

The manufacturers report that the material provides a coating that is crystalline in nature and has a weight ranging from 200 to 1200 milligrams per square foot, depending upon how it is applied and the type of steel being treated. It may be used in tanks and in pressure-spray washing machines. Salt spray resistance of painted parts treated with CrysCoat HC is said to exceed the requirements of Government Specifications. Additional

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Outstanding developments by Sel-Rex in precious metals for plating have resulted in better quality at less cost for both decorative and industrial platers. Superior engineering skill and long experience in the plating field make Sel-Rex your best choice for all precious metal plating needs.

Sel-Rex **BRIGHT GOLD PROCESS** produces pore-free "mirror bright" deposits regardless of thickness. Eliminates need for scratch brushing or buffing. Gives excellent metal distribution and deposit is twice the hardness of conventional gold. Ideally suited for specification thickness in barrel or still plating.

Sel-Rex **BRIGHT RHODIUM SOLUTIONS** provide a brilliant, durable deposit that will withstand severe abasion. The chemically stable solution is ideal for specification plating of protective coatings that will not corrode or tarnish in any atmosphere.

Sel-Rex **SILVER SOL-U-SALT** (Potassium Silver Cyanide) in pure crystalline form is completely soluble in water. Eliminates old fashioned mixing, calculating or filtering. Eliminates hazard of airborne dust—no insoluble particles in the bath to cause rough deposits.

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SARCO electric temperature control

ACCURACY AND SENSITIVITY BY SIMPLE ELECTRICAL MEANS

"Very successful in our operation, and I specify them on all our new equipment," says Thomas Allison, Plant Engineer of Southern Gravure Service, Louisville, Ky. ***(See photo at left)***

IN HIS CASE the operation is plating, an industry in which SARCO electric controls have found wide adoption.

There are many others: For example, dryers in the textile, tanning, food and chemical industries; dyeing and wet finishing processes in textiles; processing, distilling and evaporating in chemical plants.

SARCO'S complete line includes also thermostats and solenoid or motor valves for space heating, air conditioning and refrigeration control.

Get the whole story by writing for bulletins 1025 and 1080.

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EMPIRE STATE BUILDING, NEW YORK 1, N. Y.
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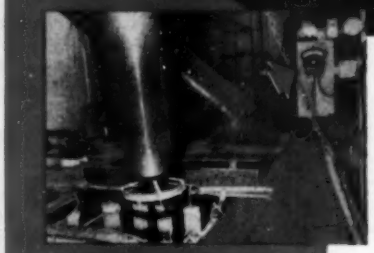
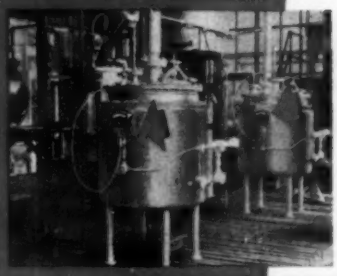


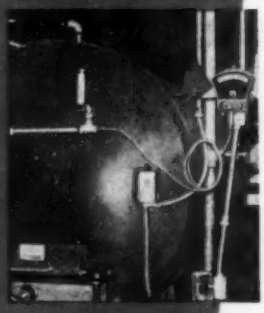
PLATING

In copper and chromium plating of rotogravure rolls, the temperature of plating solutions is held to within ½°F by Sarco Electric Indicating Temperature Controllers. Photo taken in Southern Gravure Service plant, Louisville, Ky.



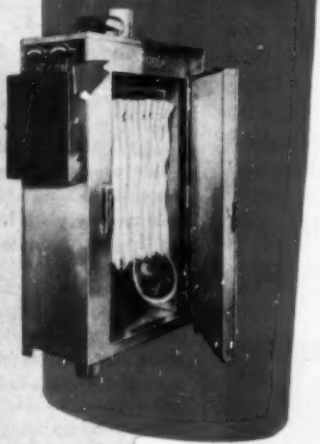
CHEMICAL

Hoffman La Roche Pharmaceutical Co., Nutley, N. J.—the jacket water temperature of these stills must be held to within ½°F. For the past 9 years, Sarco LSI Indicating Temperature Controllers have been doing that job.



FOOD

Chocolate milk and soft drinks in bottles and cans are processed in Fort Wayne Sterilizers. Many users equip these Sterilizers with Sarco LSI Electric Indicating Controllers to hold the temperature to within ½°F. Hook-up sketches and case histories on request.



TEXTILE

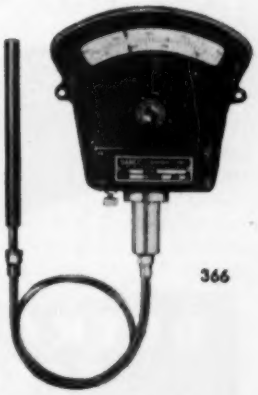
The Backus Hosiery Conditioner processes 15 denier nylon hosiery—40 dozen per 1 hour cycle. The humidity and dry heat are controlled by two Sarco Electric Indicating Temperature Controllers. Over 500 LSI's have been factory-installed on these Conditioners by Backus Machine Works, Carlstadt, N. J.

TYPE LSI

An extremely sensitive and accurate Electric Indicating Temperature Controller for temperatures from minus 90°F to plus 650°F. Controls electric heating elements, motors, solenoid or motor valves to maintain constant temperature.

A built-in thermometer makes setting easy and provides a continuous check on temperatures maintained without the bother of continually changing charts.

A double switch type L2SI is available for alternate heating and cooling control, or step control of heating or cooling.



366

Equipment and Supplies

information regarding this material is provided in a special Service Report B-1967. Use Reader Service Card.

E—517. Heat-Resistant Hard Rubber—Ace Tempron, a new synthetic hard rubber compound, now makes even greater chemical resistance, strength, and economy of hard rubber available for sustained high-temperature applications in handling many corrosive solutions.

The material was developed by American Hard Rubber Company, 95 Worth St., New York, N. Y. Tempron is a hard rubber, and has greater rigidity, heat resistance and chemical resistance than the hard and soft nitrile rubber compounds hitherto available. At present it is available in four forms: (1) pipe and fittings; (2) molded parts; (3) sheet, rod and tubes and, (4) a hand-fabricating process for making tanks, large fittings, etc., by forming sheets of Tempron around cores or mandrels while still in the soft state prior to vulcanization. In chemical resistance at elevated temperatures, it generally excels other rubber and plastic materials. At room temperature, it resists aliphatic hydrocarbons such as hexane, hexene, and other solvents such as ether, benzene, carbon tetrachloride. For additional information use Reader Service Card.

E—518. New 8 Compartment Portable Oven—Grieve-Hendry, Inc., 1817 W. Lake St., Chicago 12, Ill., announces the addition of an 8 compartment unit, called Model PL 2A, to their line of portable electric ovens. The compartments allow for separation of different sizes or types of products while drying, baking or preheating. This oven features low operating cost of less than 5 cents per hour; adjustable temperature control to 325° F; portability; operation from 110 volt a.c. outlet; fan driven forced circulation of air which forces moisture out and an adjustable damper for control of temperature. Full information may be had by using Reader Service Card.

E—519. Immersion Heater for Alkaline Solutions—A new type of heavy duty, steel sheathed portable immersion heater for alkaline bath heating has been announced by the Cleveland Process Company, 7018 Euclid Ave., Cleveland

30, Ohio. According to the manufacturer, the Clepco-Glorod Series W Immersion Heater is conservatively designed for safe operating temperature of the nickel alloy resistance element which is covered by a quartz body, claimed to be the most uniform and efficient protective conductor of heat. A sealed, vapor-proof Underwriter's Approved junction box prevents entrance of liquids and vapors. When controlled by a thermostat, each unit is in operation only for the period of time required to maintain the bath temperature. The new heater has proved successful in highly alkaline solutions and copper cyanide plating baths. It is also available with a brass sheath for maintaining constant temperature water supply. For further information use Reader Service Card.

E—520. Marking Method for Hazardous Material Containers—A quick and positive method for labeling containers holding hazardous materials is announced by the W. H. Brady Company, Milwaukee. Known as Brady QUIK-LABEL Container Markers, these labels stick fast to glass, metal, wood, plastic or ceramic containers, without moistening. They're made of strong cotton cloth, and are silicone plastic-coated to resist oil, grease, grime and abrasion. The label surface is not affected by most of the materials the container may hold.

Most Brady container markers are

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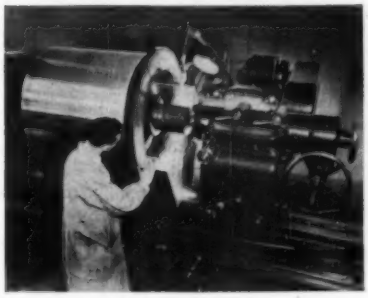
printed with various words and precautionary instructions, and have a space provided on each marker for a self-sticking insert which has the specific name of the hazardous material—such as acid, naphtha, lacquer or kerosene—printed on it. For further information and free samples of Brady Container Markers, write to: W. H. Brady Company, Dept. P, 727 W. Glendale Ave., Milwaukee 12, Wisc., or use Reader Service Card.

E—521. Vitrified Bond for Grinding Wheels—Norton Company has announced a new vitrified bond for their grinding wheels which users are claiming



as a radical improvement. Named "G-Bond", and identified by the symbols "VG" in the marking, field tests conducted in plants all over the country reveal incredibly good performance for cylindrical, centerless, surface, internal, gear, tool and cutter, form and thread grinding, and saw gumming.

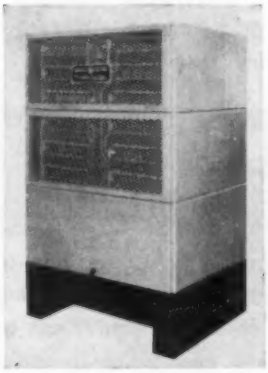
"G-Bond's" advantages are seven: can do more work per wheel; cut cooler, freer and faster than wheels with other bonds; more pieces per dressing and easier to dress; cover a wider range of jobs; hold shape, therefore well suited for form grinding; hold corners better; and ideal for crush dressing. All these mean improved quality of work at less cost. For additional information on this new product use Reader Service Card.

E—522. Magnus Waterless Hand Cleaner—Magnus Chemical Company, Inc., Garwood, N. J., announces the marketing of a hand cleaner which removes grease, paint, tar, grime, inks including litho and stencil. A white stiff jell containing a generous amount of lanolin, it has no odor of solvent or ammonia. When water is not available it may be wiped off with a towel, leaving the hands soft, without a tacky feeling. Containing no alkali, it is neutral in its reactions and will not irritate or dry out the skin. Complete information about this product may be obtained by writing to Magnus Chemical Company, Inc., Dept. P, Garwood, N. J., or through use of Reader Service Card.

E—523. Flame-Resistant Protective Curtains—Impregnated, flame-resistant canvas curtains and blankets that can be hung to form inexpensive booths to screen off dangerous operations are now being offered by Eastern Equipment Company, Inc., Willow Grove, Pa. The curtains and blankets afford complete protection for workers near arc welding and other operations where arc flash, molten splash, flying chips, scale, etc. are produced. Curtains are made to individual requirements from 8, 10 or 12 ounce duck and from Underwriters grade asbestos cloth in sizes to over 100 square feet. They contain sturdy, firmly fastened brass grommets a foot apart on one long side. For additional information use Reader Service Card.

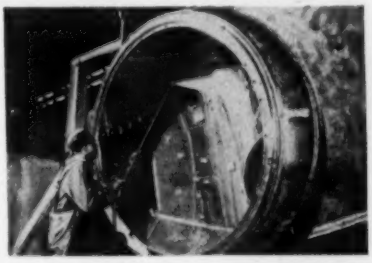
E—524. Styrene Pipe Now Available—Atlas Mineral Products Company announces that it now has available a complete line of plastic pipe based on high impact styrene in sizes ranging from ½ inch to 6 inch O.D. Threaded fittings are available in sizes up to 2 inches. This product is known as Ampcolite and supplements the Ampcoflex rigid polyvinyl line pioneered by this firm. Ampcolite pipe, which is available in 10 and 20 foot lengths has outstanding impact resistance and good resistance to a wide variety of corrosives. For further information use Reader Service Card.

E—525. Electroplating Power Supplies—A complete new line of metallic rectifier power supplies for electroplating and anodizing operations has been announced by the General Electric Company's Lighting & Rectifier Department.



Incorporating a number of advances in operating convenience and efficiency, the new equipment is substantially lower in price than former units because of the extensive use of interchangeable standardized components. The line includes manually controlled and automatically regulated units as well as special equipment for barrel plating and precision laboratory work. Maximum operating economy in each rating is achieved by using a variety of circuits and either copper-oxide or selenium rectifier stacks, depending on the output desired. For additional information use Reader Service Card.

E—526. New Solvent Phosphating Cleaner—This new material, known as Solo-Phos (patent pending) is said to be a three-in-one cleaner. It removes grease and tar, cleans off chips and gives a rust-inhibitive phosphate coating. Developed by the Whitfield Chemical Company, 14227 Schaefer Highway, Detroit 27, the cleaner is used for one-step cold cleaning and phosphating of ferrous metals, aluminum and zinc. It reacts with organic or metallic soils, and has a high solvency for oil, grease, and tar. The rust-inhibitive film formed on metal surfaces makes an ideal base for painting.



Solo-Phos can be applied in concentrated form by spraying, flushing, or dipping. Only standard equipment is necessary. For additional information use Reader Service Card.

E—527. New Finish for Aluminum—Possibilities for countless new uses for aluminum have opened up with the recent introduction of a new process by Miracle Finishes, Inc., 10 Water St., Brooklyn 1, N. Y. The process, called D'orium gives aluminum a gold finish which is so realistic that it is almost impossible to detect the difference by eye alone between it and genuine gold. Six shades of gold can be achieved, as well as many other colors, all of which have a high lustre and are non-corrosive. The finish in which no gold is used will not tarnish or discolor and since it is an integral part of the metal itself it can't chip, peel or crack. Further information on D'orium can be obtained by using Reader Service Card.

E—528. Plastic Glove Reconditioning Service—U. S. Industrial Glove Corporation, 9350 Roselawn, Detroit 4, Mich., announces a new service to industry, the reconditioning and reprocessing of worn and damaged, smooth and rough plastic dipped cotton gloves. The new service designated as "Over-Kote", is available in practically all industrial areas through the corporation's Gloveo National Service. Thorough investigation and tests have proven that up to 90 per cent of previously discarded gloves can be reclaimed and that the service is as practical and workable as that of reconditioning fabric and leather gloves with important

FIND OUT ABOUT **IRIDITE**® TODAY for finishing ZINC, CADMIUM, ALUMINUM, CUPROUS METALS

WANT CORROSION RESISTANCE? Iridite will give you better-than-specification protection against corrosion.

WANT PAINT ADHERENCE? Iridite provides a firm and lasting base for paint by preventing under-film corrosion.

WANT EYE-APPEAL? Iridite can give you a variety of finishes, depending upon the metal being finished . . . from clear and sparkling bright or military olive drab, to attractive dyed colors.

BEST OF ALL, any Iridite finish is economical and easy to apply.

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Simple chemical dip; immersion time only 10 seconds to 2 minutes; no sealing dip; color is clear or yellow depending upon your requirements; salt spray resistance equivalent to 20 to 30 minutes of anodizing, eliminates need for costly racks and electrical power.

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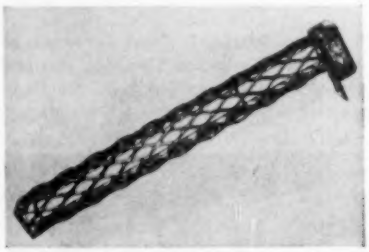
Manufacturers of Iridite Finishes
for Corrosion Protection and Paint Systems on Non-Ferrous Metals; ARP Plating Brighteners.
West Coast Licensee: L. H. BUTCHER COMPANY

savings possible to industry. For additional information use Reader Service Card.

E—529. Electric Radiant Immersion Heater—Introduction of the Glo-Quartz electric radiant immersion heater makes it possible to heat all acid electroplating, electropolishing, pickling and phosphatizing solutions with 100 per cent efficiency.



The smooth surfaced fused quartz sheath is resistant to all acids with the exception of hydrofluoric. The units are ideally suited for heating phosphatizing solutions since no deposits can form on the surfaces of the heating elements. They are available in a large range of standard sizes in various voltages. For further information write to the manufacturer Glo-Quartz Electric Heater Company, Inc., 37936 Elm St., Willoughby, Ohio or use Reader Service Card.

E—530. Dipping Process Cuts Cost 50 Per Cent—Production costs have been reduced more than 50 per cent on baked enamel and lacquer finishes of small metal parts for industry as a result of a new dipping process of the Apex Stamping Company, 70-P Marshall St., Newark, N. J.

The new method has speeded up the time of production by as much as 300 per cent in coating parts from one-half inch to two feet in length because of a conveyorized system for coating that was formerly possible only by the spraying method. In addition, costs have been reduced by the elimination of the paint waste, which ran as high as 85 per cent in the spray method, and the complete elimination of rejects, which ran as much as 25 per cent in some products. For additional data use Reader Service Card.

E—531. Automatic Emergency Lighting Unit—In case of power failure this unit will provide maximum protection and sufficient illumination to carry on operations for many hours. Designed primarily for industrial plants, laboratories and other places where that extra margin of safety is a must it provides light that instantly illuminates the room if regular power fails.

The unit is powered by a storage battery built into the portable set. A trickle charger automatically maintains the charge of the battery. A built-in hydrom-

eter indicates the state of the battery at a glance. Write to General Scientific Equipment Company, 2700P W. Huntington St., Philadelphia 32, Pa., or use Reader Service Card.

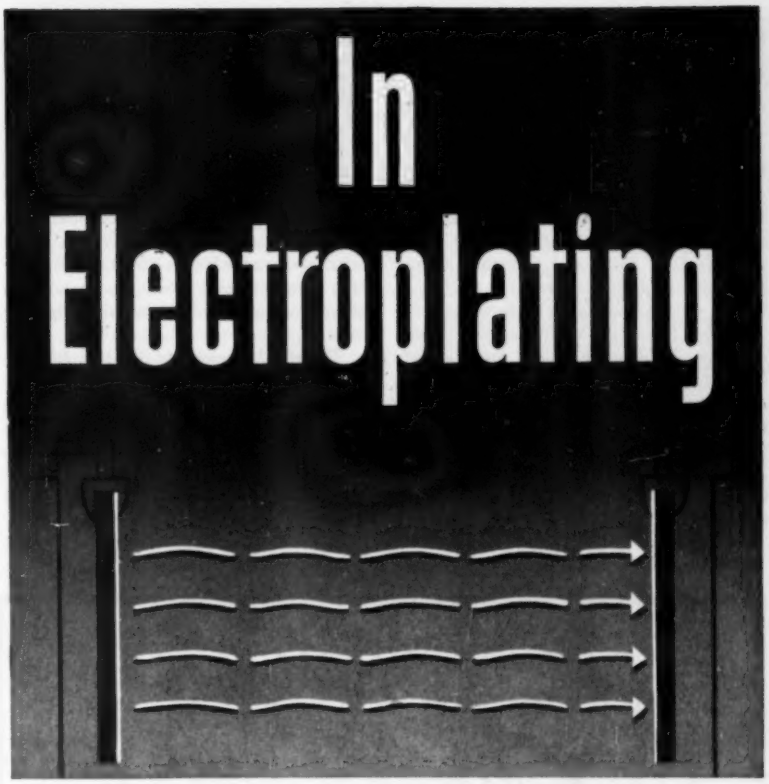
E—532. Completely Submerged Plating Barrel—The Hanson-Van Winkle-Munning Company, Matawan, N. J., announces new equipment which completely immerses the plating barrel in the electrolyte. The new equipment includes both barrel and plating tank and permits greater current density and thus enables faster plating. The barrel is hexagonal in shape and has an inside diameter of 14 inches. Barrels are available in 30 and 36 inch lengths of Plexiglas or Melamine construction.

Tanks are constructed of ¼ inch double electric-welded steel and are painted with rust-protective gray enamel and trimmed with black. Each tank has a 2 inch drain at the bottom and has space for mounting two heating or cooling coils. Special vulcanized-rubber or koroseal-lined tanks are available for use with acid solutions. For further information about submerged barrel plating write to the Hanson-Van Winkle-Munning Company, Matawan, N. J., and ask for Bulletin PB 108P or use Reader Service Card.

E—533. Twin-Tunnel Metal Washing Machine—A new metal cleaning machine, featuring a two-in-one space saving design, has been announced by Cincinnati Cleaning & Finishing Machinery Company, Dept. P, Schmidt Building, Cincinnati 2, Ohio. Recently installed by a division of a leading refrigeration manufacturer, it processes both monorail conveyor and belt conveyor production.

The machine has a tunnel, in which parts carried on the plant monorail conveyor system are washed, above a tunnel through which miscellaneous large and small parts are carried on a wire mesh belt through washing, rinsing and drying operations. Parts on the monorail system are carried through the washing machine without attention, being loaded at the preceding work station and unloaded at the work station (painting) which follows the cleaning process. Additional details may be obtained. Use Reader Service Card.

E—534. New Safety Goggle Line—A new line of safety goggles and spectacles meeting strictest safety specifications has just been placed on the market by Pulmosan Safety Equipment Corporation, 644 Pacific St., Brooklyn 17, N. Y. The complete line includes types for all eye hazards met in industry, including hardened lenses for chipping, grinding and impact and special constructions for dusts and chemicals. Spectacles are available in a choice of metal or plastic frames, with and without side screens as are types to fit



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Potassium Cyanide is widely used in the copper plating of automobile parts, such as bumpers, door handles, and grilles, where copper is used as a base coat for chromium plating.

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Pittsburgh 19, Pa.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 529.

Equipment and Supplies

over prescription glasses. For more information use Reader Service Card.

E—535. Lens Cleaning Aid—A new anti-fog and lens cleaning cloth has been developed by the Carol Chemical Company, 368 E. 45th St., Brooklyn 3, N. Y., for use on glass or plastic surfaces, to prevent the formation of fog or steam on eye-glasses, shields, windows, etc., caused by body heat, humidity or temperature changes. By simply wiping the surface to be treated with the impregnated NO-MIST cloth, the object is both cleaned and fog-proofed in one quick, easy operation. For more information use Reader Service Card.

E—536. Universal Cleaning Spray—Applied by a hand-sized pressure spray gun, Kelite Spray White, a product of Kelite Products, Inc., is a new industrial cleaner now being marketed as the "first universal cleaner". It removes grease, oil, wax, gums, dirt, dye, ink, cutting soap, light carbon, etc., with complete safety to all metals, plastics, rubber, porcelain, composition, concrete or wood when used according to directions. Cleaning is accomplished without heat, odor, fumes, solvents, fire-hazard or danger to skin.

The sturdy spray gun can be refilled in a few seconds and holds enough Spray White for several hours of average cleaning. Further information may be had by writing the manufacturer at 1250 N. Main St., Los Angeles 12, or through use of Reader Service Card. Ask for Bulletin 126P.

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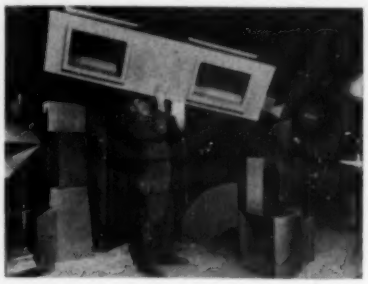
That's our NARACO "Staff" telling you to COME AND GET the FINEST SERVICE available in the field of custom built racks and fixtures. If you've been "Hungry" for the sight of a perfectly plated part, if you've longed for smooth production and repeated success in plating then answer NARACO'S call and COME AND GET IT!
NARACO

E—537. Fiberglas Reinforced Polyester Laminate—Tanks and ducts are now being fabricated to specifications, without limitation as to size and shape, of Iolyte, a Fiberglas reinforced polyester laminate. No molds are used and a number of advantages are claimed: Economy, chemical resistance, light weight, ease of installation, etc. For further information write Schori Process Division, Ferro-Co Corporation, 8-11 43rd Rd., Long Island City 1, N. Y. or use Reader Service Card.



E—538. Neoprene Industrial Overshoes—These new neoprene rubbers are designed for men who wear overshoes on the job, and especially for men who work around oils, solvents, acids and other chemicals which damage ordinary rubbers. The overshoes are unusual in that they have no fabric lining. Field tests, according to the manufacturer, have shown that omission of the fabric exacts no sacrifice in durability—and does result in important advantages of lightness and comfort. Manufacturer is Tingley Rubber Corporation, 903 Ross St., Rahway, N. J. For further information use Reader Service Card.

E—539. High Temperature Brazing Flux—A new flux with extra penetration and protection for high temperature brazing and hard soldering of ferrous and nonferrous metals is announced by Special Chemicals Corporation, 30 Irving Place, New York City.

According to the manufacturer, new Kwikflux No. 94, because of its greater film strength, eliminates island formation, prevents oxidation and scale, protects and cleans metal surfaces when brazing at high temperature and is non-spattering.

Free working samples and details are available on request. State type of work, alloys used and type of heat application and mail request to Special Chemicals Corporation, 30-P Irving Place, New York 3, N. Y., or use Reader Service Card.

E—540. High and Low-Temperature Environmental Test Equipment—Tenney Engineering, Inc., 26 Ave. B, Newark 5, N. J., announces a standard line of high and low-temperature environmental test equipment designed to provide

test conditions for the majority of all temperature testing requirements. This standardization permits purchasers to select chambers from existing specifications and eliminates the extra cost of custom built models.

Comprising two separate units, the equipment furnishes controlled temperatures for conducting physical tests, weathering tests, and aging tests. The units may be purchased independently or collectively. For additional information on these units use Reader Service Card.

E—541. Floor Mats Reduce Fatique and Slippery-Floor Hazards—Corrugated mats made of especially compounded rubber links woven on 12 gauge spring steel wire provide sure comfortable footing to stop slipping accidents and reduce worker fatigue. GS-mats are particularly adapted for use where moisture, acids, chemicals, solvents and abrasives are apt to be on the floor as the rubber resists deterioration. They are easy to clean and easy to handle, lay flat or roll up. They are recommended by leading safety engineers to increase efficiency and production and are available in any desired length and in widths up to 48 inches. For complete information write to General Scientific Equipment Company, 2702 W. Huntingdon St., Philadelphia 5, Pa., or use Reader Service Card.

E—542. Chemical Resistant Coveralls—Made of a new light-weight, tough, acid and alkali-resistant Vinyon-N fabric, Feon coveralls are announced by Filtration Fabric Division of Filration Engineers, Inc.,

153 Oraton St., Newark 4, N. J. Though they are made from a relatively expensive fabric for complete resistance to chemicals and commercial launderings, and are offered at competitive prices, the new coveralls are cut extra full for active men. The Feon fabric is not affected by concentrated mineral acids and alkalies, and has very high resistance to a wide variety of inorganic acids, bases, and salts. It is also immune to bacteria and mildew. Pockets and thread are of the same chemical-resistant, tough, synthetic fiber, for full life protection. For additional information use Reader Service Card.

E—543. New Polarographic Instrument—A new instrument, specifically designed for analytical control of plating solutions, is announced by Patwin Instruments of Waterbury, Conn.

Polarographic methods of analysis save a considerable amount of time (in many cases analytical time is reduced by one-half or more) and they eliminate the necessity of and maintenance of several solutions as is usually required by chemical methods.

The Patwin instrument may also be used for the detection and determination of impurities, in routine analysis and in plating research to study mechanisms of electrode reactions, decomposition potentials, complex ion formation and addition agents. Known as the Patwin Model C Electro-Polarizer, the instrument is a simplified and lower priced companion to the Company's Model R Electro-Polarizer previously announced. For additional information use Reader Service Card.

E—544. Wet Blasting Machine—The addition of a new model to its line of wet blasting machines is announced by American Wheelabrator & Equipment Corporation, 1180 S. Byrkit St., Mishawaka, Ind. Known as the Model 30 Liquamatte, it is intended for precision cleaning and finishing applications involving small pieces that can be lifted and handled manually.

The machine, sized 2 feet 6 inches in length by 2 feet 6 inches in width by 6 feet 11 inches in height, has a blasting compartment thirty inches square and 2 feet 7 inches high. Since such fine mesh abrasives are used (80 to 2500 mesh), close-tolerance dimensions are maintained, and sharp corners, lines, and lettering in patterns remain undamaged. Tolerances of 0.0001 inch can be maintained where required. For more information use Reader Service Card.

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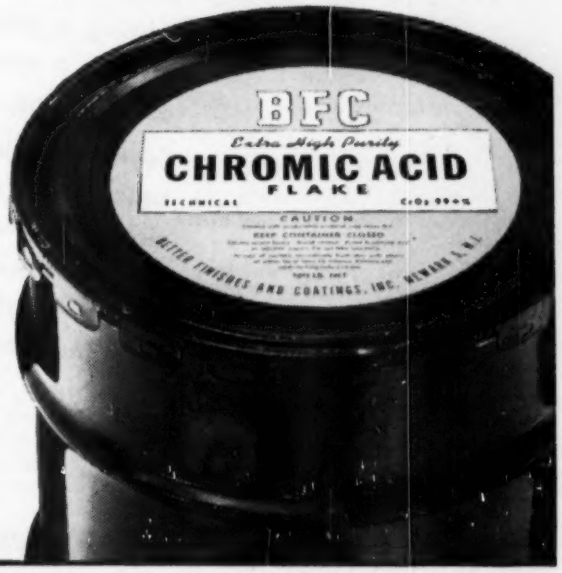

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Where specific thicknesses of bright nickel are desired, use Seymour "NC" or "CK" Bright Nickel Processes in a warm plating bath. The warm type brightener solution permits specification barrel nickel plating of any desired deposit from .0002" to .0010", and at a speed four to six times faster than with a cold solution.

Seymour solutions are also available for cold plating baths where a deposit of about .0001" maximum is desired. Both warm and cold type brighteners are simple to maintain and easy to control. Deposits are adherent to properly cleaned base metals, except zinc base direct, and may be chromium plated without prior buffing or wiping.

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SEYMOUR

Mail Box

Subject: Electroplating in New Zealand

DEAR SIR:

Our trip to Australia was scheduled to start on February 3 but an attack of flu compelled me to postpone our departure till February 9, and to cancel a scheduled talk to the Dallas-Fort Worth Branch. In Los Angeles, I spoke to the A. E. S. Branch.

When we originally planned to spend a week in New Zealand en route to Australia, I had no knowledge or thought of any electroplating industry in that country. However, officials of the New Zealand Department of Scientific and Industrial Research (DSIR) learned of my visit and requested me to give the following talks on the research work of the N. B. S. and A. E. S.:

Feb. 20—Auckland Manufacturers' Association, including a group of platers

Feb. 23—A joint meeting of the N. Z. Institute of Chemistry and the Royal Society of New Zealand at Victoria University College in Wellington

Feb. 24—The Manufacturers Association and Electroplaters of Wellington

Feb. 26—The Manufacturers Association and Electroplaters of Christ Church

At each of these meetings there were about 30 persons present and many questions were asked after each lecture.

With so short a time as one week in New Zealand, it was not possible for me to make any detailed study of electroplating practice here. There are no large manufacturing plants in New Zealand, and hence no large plating plants. In the three principal cities, there are a total of about 50 plating shops, some of which are quite small. In each city the platers have an informal group, organized under the Manufacturers' Association, but not affiliated with any society.

A few plating plants are connected with manufacturing firms; others are job-platers, whose work may consist partly of new products and partly of replating.

Most of the plating supplies, bright nickel baths and equipment are purchased from England, largely because funds can be sent from New Zealand to other "sterling" countries, but not to others such as U. S. A. I did not learn of any members of the A. E. S. here, again in part because they cannot send out funds. I learned of only one copy of PLATING here in the DSIR office in Wellington. This government organization is assisting various industries, and inquiries were made as to how they might help electroplating.

Among other ways, I suggested the organization of classes for platers, and the acquisition and distribution of more literature on plating from England and U. S. A.

New Zealand is a young, vigorous country that is handicapped in plating, as in many other fields, by their isolation, being about 10,000 miles from U. S. A. or England and 1,500 miles from Australia. The country is larger than one would first judge from a map, but is very mountainous, with marvelous scenery. Everywhere, Mrs. Blum and I have been very cordially welcomed and entertained by platers' groups. Our only regret is that we did not include a longer visit here.

In Auckland, we were met and assisted by the American Consul. In Wellington, we were greeted by the American Ambassador, Mr. Scotten and his military aide, Col. Heim.

W. BLUM
Christ Church, New Zealand

Subject: First Impressions of Australia

DEAR SIR:

Three weeks in Australia have given Mrs. Blum and me an opportunity to form some idea of the country, the people and the activities.

The best way to record our enthusiasm over the friendliness and hospitality of our hosts is to summarize briefly the events of our busy schedule.

When we arrived at the Melbourne Airport on February 27, we were met by the A. E. S. Convention Committee and their wives, who gave us a cordial welcome. Two days later, this Committee and the Executive Board of the Melbourne Branch gave a tea for us at which we became acquainted with these men and their wives.

They provided for us a daily schedule of plant visits, lectures and sightseeing trips, which have kept us busy and happy.

The first week was spent largely in visits to become acquainted with the officials of the Defence Department, the General Motors-Holden plant, the American Consulate, the U. S. Military Attaché, and others who helped to plan the program. We had the pleasure of visiting Mr. Brens, the Lord Mayor of Melbourne, who invited us to have "tea" with him.

Our second week was spent in Tasmania, the southernmost location in our trip. At Hobart and Launceston, lectures on electrodeposition and on corrosion were given to local branches of the Royal Australian Chemical Institute. At Hobart, a visit was made to the Electrolytic Zinc Works, the second largest in the world, that produces daily 300 tons of zinc and a ton of cadmium. There are almost no plating plants in Tasmania, where the principal products are sheep and apples.

We returned to Melbourne on March 15. On March 17, a lecture on Corrosion Testing was given to a large meeting of the Melbourne Chemical Institute. Following the lecture and discussion, the films on corrosion, prepared by Frank La Que of International Nickel Company, were shown.

My first formal contact with the Melbourne Branch of A. E. S. was on March 19, when their meeting was attended by 110 persons. I was much pleased to be made the first Honorary Member of the Melbourne Branch. I also had the honor of presenting past-president buttons to eight past presidents of this Branch. I gave a lecture, illustrated with slides, upon the "Electroplating Researches of the National Bureau of Standards", which was followed by questions and discussions.

We have had remarkably clear weather. This is the beginning of Fall, and cool weather is expected, as we did experience in New Zealand and Tasmania. But in Melbourne in the past few weeks they have had a hot spell, with temperatures up to 101° F. Mrs. Blum feels that this was done for her special benefit, as she dislikes cold weather.

Thus far, I have visited only a few plating plants, most of these are relatively small, but modern methods and equipment are in use.

The local members have expressed their appreciation to the A. E. S. Executive Board for their interest in and contribution toward this trip. We feel that such contacts as these will not only establish a closer and more cordial contact between the A. E. S. and its Australian Branches, but will also contribute toward a better understanding between our nations, now so important to this troubled world. We are happy and proud to do our small part in this effort.

WILLIAM BLUM

Subject: Dr. Schaefer's Proposal for Proceedings

DEAR SIR:

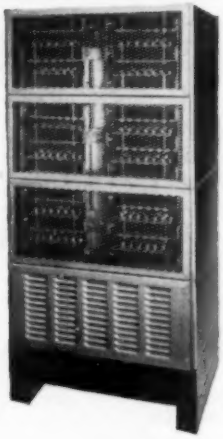
Dr. Ralph Shaefer's proposal in the March issue of PLATING to consolidate all the technical publications of the Society in one bound volume issued annually, without curtailing in any way the monthly publication of PLATING as it now appears is to be highly commended. It should be particularly appreciated after last year's *Proceedings* (1951), which indexes several convention papers and then refers the reader to one or more issues of PLATING where the paper and discussion were published, sometimes in two issues.

Speaking as one member, I am heartily in favor of Dr. Schaefer's proposal and would be willing to pay extra to get it, but since it is offered at no extra cost, I can see no valid reason for not adopting it.

Very truly yours,
LEON R. WESTBROOK

LABORATORY PLATING

Power supplies for laboratory plating are precisely controlled for experimental and pilot plant work. Laboratory platers are rated 50 amperes at 9 volts and 65 amperes at 18 volts.



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Barrel Plating power supplies are wall or floor mounted, depending on electrical rating. Copper-oxide stacks last almost indefinitely, offer higher efficiency, less aging, than any used before.

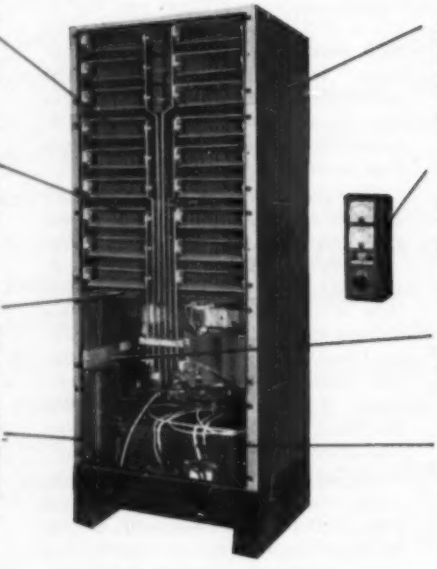
G.E. Announces A Complete

RECTIFIER STACKS have much longer life. Selenium stacks exactly like those used in unit have already lasted over 60,000 hours. Copper-oxide rectifiers, operated at proper ratings, last almost indefinitely.

PROTECTION. Transformer coils are protected against corrosive atmospheres by heat impregnation. Acid-resistant paint protects rectifiers. Oil-immersed selenium stacks are available for thorough protection against severely corrosive conditions, when required.

FORCED AIR COOLING. Fan draws air in from the front of the unit, across and down over stacks, transformer and saturable reactor. This design avoids dust and dirt intake, and permits solid top for protection against dripping.

STURDY CONSTRUCTION. Casing on floor-mounted units is ⅛ inch sheet steel and expanded steel screening. Base is reinforced by steel members, and designed for moving by fork truck. Front and rear panels are easily removable.



EXTERIOR FINISH. Steel parts are phosphatized, primed with hot filler, inside and out. Painted with hard, durable, acid-resistant paint which stands up under severe corrosive conditions found in electro-plating rooms. American standard No. 49 medium light grey color is used.

CONTROL STATION. Designed for wall mounting either beside the tank or power supplies, the operator's control station is provided with manually controlled and automatically regulated power supplies. It includes voltmeter, ammeter, voltage level control device, and START-STOP push buttons where specified.

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ALMOST NO MAINTENANCE Down-draft cooling design minimizes dirt and dust intake into the equipment. The fan is the only moving part, and requires only occasional lubrication.

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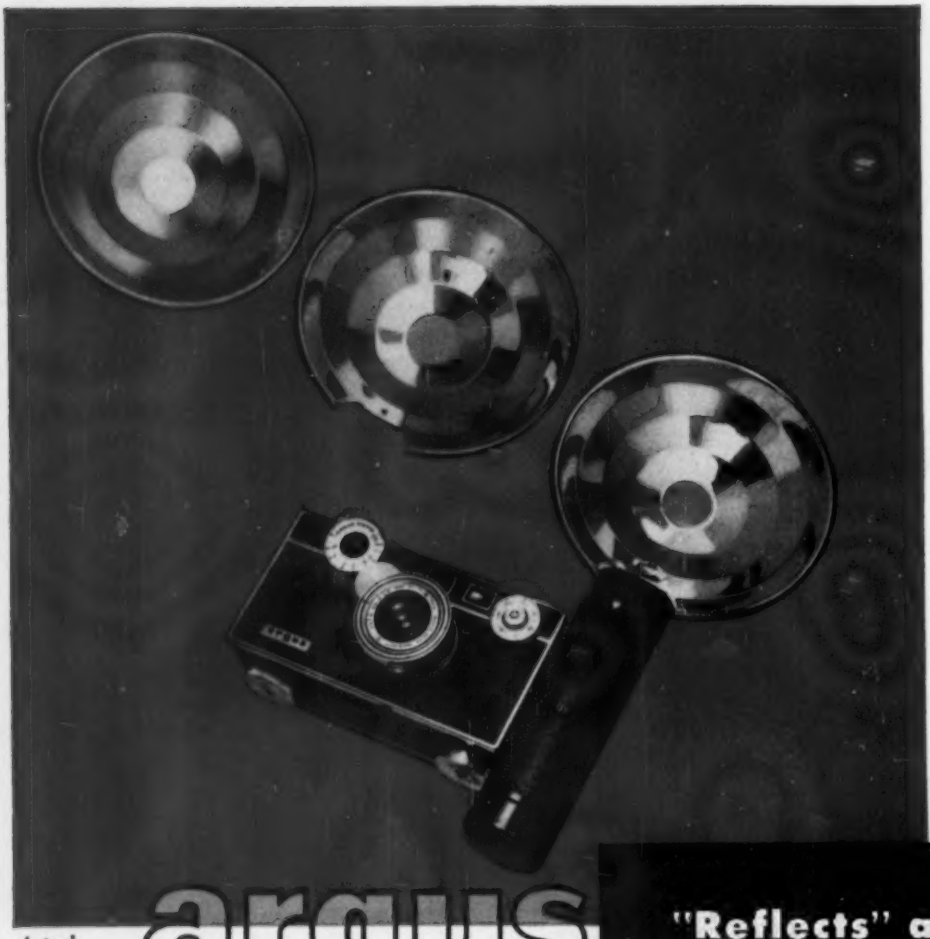

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plating

MAY, 1953 VOL. 40, No. 5

Contents

Influence of Operating Variables on Composition of Electroplated Lead-Tin Alloys..... 470
A. H. DuRose and D. M. Hutchison

A Report on Japanese Electroplating Practice..... 477
Ezra A. Blount

A. E. S.—For Electroplaters or Metal Finishers?..... 488
Leonard Weeg

Cleaning and Preparation of Metals for Electroplating. VI. Sensitivity of Degreasing Evaluation Tests..... 489
H. B. Linford and E. B. Saubestre

40th Annual Convention—Final Pre-Convention Report..... 499

Monthly Features

Advertising Index..... 539
A. E. S. Directory..... 536
A. E. S. News..... 514
Article Abstracts..... 502
Book Review..... 500
Branch News..... 514
Editorial..... 469
Equipment and Supplies..... 454
Future Meetings..... 540
Industry News..... 434
In This Issue..... 432
Mail Box..... 463
Membership Report..... 534
Patent Abstracts..... 510
Personals..... 440
Society News..... 438
Trade Literature..... 450

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This month's cover photo shows the hand scrubbing of lead-antimony castings and in some respects attests to the 10–20 year lag of Japanese plating practice as compared to that of the United States.

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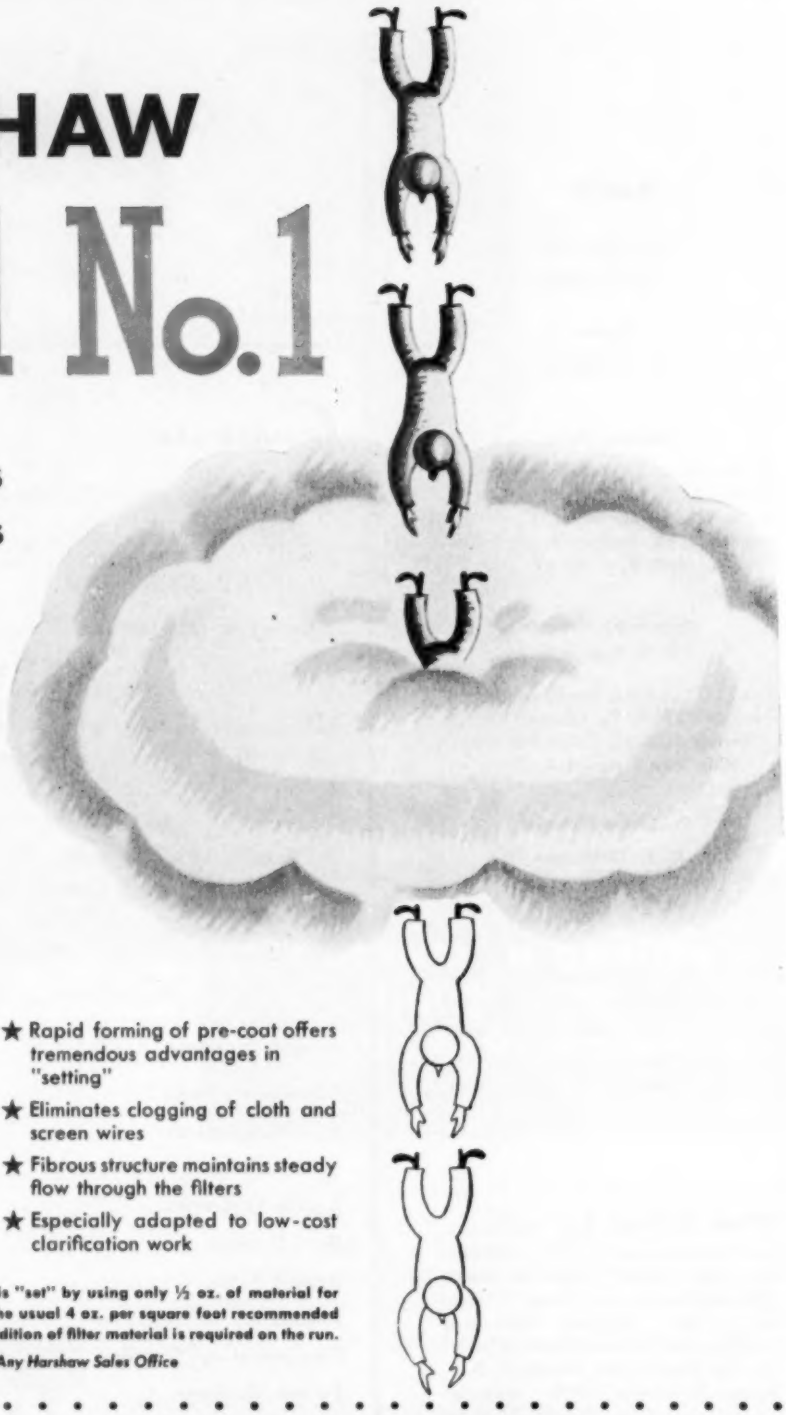

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Editorial

"The Object of the Society shall be . . ."

FROM THE EARLIEST DAYS of the American Electroplaters' Society one of its aims has been the open discussion of topics of general interest in the membership. The article in this issue by Mr. Weeg falls into such a category, and is published, appropriately, at a time when the Society is about to hold its Annual Meeting, thus permitting an active consideration of the subject by the largest possible gathering of the membership.

Oddly enough—even before the formation of the National Electroplaters' Association, the predecessor of the A. E. S.—one of the men in the industry at that time, when the formation of a society was being proposed, suggested that it "have a little wider field and include other branches of metal finishing . . . chiefly . . . japanning and lacquering, as these two forms of metal finishing are in many factories under the supervision of the foremen of the plating department".

Spirited deliberation of such topics makes for an alert membership which in turn promotes the Society's growth in technical stature and in numbers. Through such activity, in part, the A. E. S. membership has more than doubled in the past ten years. One does not appear to be over-optimistic in looking for a continuation, in the next ten years, of that rate of growth along with the added gain in technical prominence that results from a larger Society.

Al Korbelak

Influence of Operating Variables on Composition of Electroplated Lead-Tin Alloys

A. H. DuROSE* AND D. M. HUTCHISON*

Abstract

The object of the study reported in this paper was to secure data on the influence of certain operating variables on the composition of lead-tin alloys plated from fluoborate solutions. The variables investigated were current density, lead-tin ratio, total metal content, and addition agent content. Data are presented in the form of graphs. An electrolytic method for the determination of the alloy composition was tested in connection with this project. This method is offered as an aid in solution control, particularly for control of addition agent content.

Introduction

The merits of lead-tin alloy coatings for specific purposes have been recognized for many years. Until recently, the principal method of application of such coatings has been the hot-dip method, because of the relative simplicity of the process and the low melting point of the alloy. In recent years, however, electrodeposited coatings have been gaining favor because of the superior physical properties of the plated alloy, and the adaptability of the process to rigid dimensional control.

The most important applications for this type of coating are the following:(1) 4–10 per cent Tin. Corrosion protection of steel; (2) 7–10 per cent Tin. Bearings. (Small percentages of copper and antimony are usually included in alloys for this purpose.); (3) 10–60 per cent Tin. Solderable coatings.

Electroplated lead-tin alloy coatings are deposited almost exclusively from fluoborate solutions. While there are several papers on lead-tin alloy plating[1,2,3,4,5,6], data on the influence of ordinary operating variables on the alloy composition are inadequate. Some authors give specific bath formulations to produce a specific alloy composition but the influence of operating variables on this composition is not presented. To obtain the stated alloy composition strict adherence to the given set of conditions is necessary. Should circumstances require that a variable be fixed at a value other than that given, there are available only meager data to guide the operator in adjusting the other variables to obtain the desired results. A cursory examination of previously published data seems to indicate a lack of agreement among various authors but re-examination of the data, with a fuller understanding of the influence of certain variables, shows that agreement among previous authors is fairly good.

Purpose

The purpose of this paper is two-fold. The first is to attempt to fill the need for data on the influence of operating variables on the composition of the plated alloy. The second is to introduce a new method for determination of the alloy composition, which may be used as a control measure in operating the alloy plating bath.

For this paper, the following conditions were studied:

1. *Per Cent Tin in Solution.* The percentage of the total metal content as stannous tin was varied from 3 to 55 per cent of the metal in solution. In Table I, the capital letter designation in the code indicates the per cent of the metal content in solution as stannous tin.

2. *Addition Agents and Addition Agent Concentra-*

*The Harshaw Chemical Company, Cleveland, Ohio.

TABLE I. SOLUTION COMPOSITION

Code Letter	Tin Per Cent	Addition Agent Content*			Total Metal Content					
					Dilute Bath 100 g/l		Intermediate Bath 175 g/l		Concentrated Bath 250 g/l	
		Code No.	Glue	Resorcinol	Pb g/l	Sn g/l	Pb g/l	Sn g/l	Pb g/l	Sn g/l
A	3	1	0.4		97.0	3.0	169.75	5.25	242.5	7.5
A	3	2	0.4	0.5	97.0	3.0			242.5	7.5
B	6	1	0.4		94.0	6.0	164.5	10.5	235.0	15.0
B	6	2	0.4	0.5	94.0	6.0			235.0	15.0
C	10	1	0.4		90.0	10.0	157.5	17.5	225.0	25.0
C	10	2	1.0		90.0	10.0			225.0	25.0
C	10	3	1.0	0.5	90.0	10.0			225.0	25.0
D	24	1	0.4		76.0	24.0	133.0	42.0	190.0	60.0
D	24	2	1.5		76.0	24.0			190.0	60.0
D	24	3	1.5	1.0	76.0	24.0			190.0	60.0
E	50	1	0.4						125.0	125.0
E	50	2	2.0						125.0	125.0
E	50	3	2.0	1.0					125.0	125.0
F	55	1	0.4		45.0	55.0	78.75	96.25		
F	55	2	2.0		45.0	55.0				
F	55	3	2.0	1.0	45.0	55.0				

*Grams per liter.

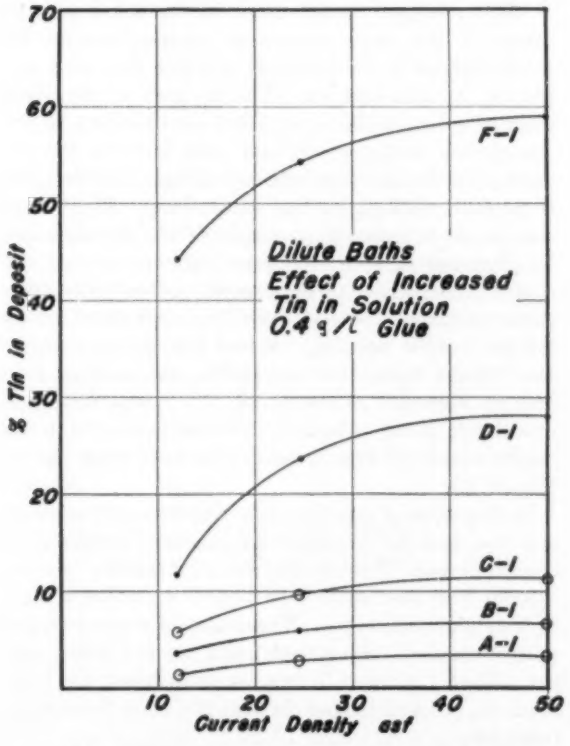


Fig. 1. Effect of Tin Content of Bath on Composition of Alloy

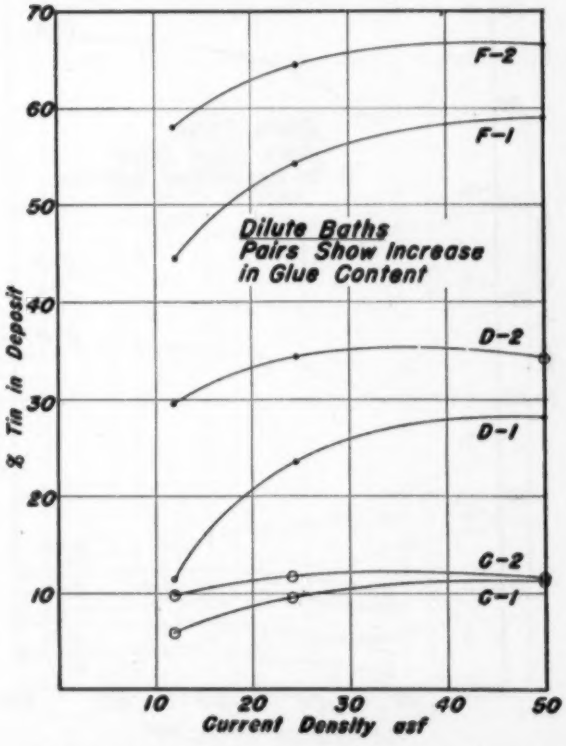


Fig. 2. Effect of Increasing Glue Concentration of Bath on Tin Content of Electrodeposited Alloy

tion. All baths were run initially with a glue content of 0.4 g/l. The glue content was then increased in each bath, followed by an addition of resorcinol. In Table I, addition agent changes are designated by the code number.

3. *Total Metal Content.* Each of the above variables was checked in baths containing 100, 175, and 250 g/l total metal content. These baths are referred to in the tables as dilute, intermediate, and concentrated, respectively.

4. *Current Density.* In each bath the alloy composition was determined on deposits plated at 12, 25, and 50 asf. In the concentrated bath 100 asf were used instead of 50 asf.

In addition to a rather extensive study of the above variables, several others of relatively minor importance were investigated to a limited extent.

While compiling data on the influence of these variables in the lead-tin alloy bath, the authors tested an electrolytic (coulometric) method for determination of the alloy composition. This method is believed to be faster and more convenient for solution control purposes than chemical analysis of the alloy. The electrolytic method is based on determination of the weight of a given alloy deposit (by weighing the cathode before and after plating) and the exact number of ampere hours required to deposit the alloy. The latter is established by using a calibrated ammeter and a stop watch, or by operating a coulometer in series with the alloy plating solution. Results obtained by this method were compared with chemical analyses on over 80 alloy deposits, ranging from 0–70 per cent tin. A statistical analysis of these results is given in the section on precision and accuracy.

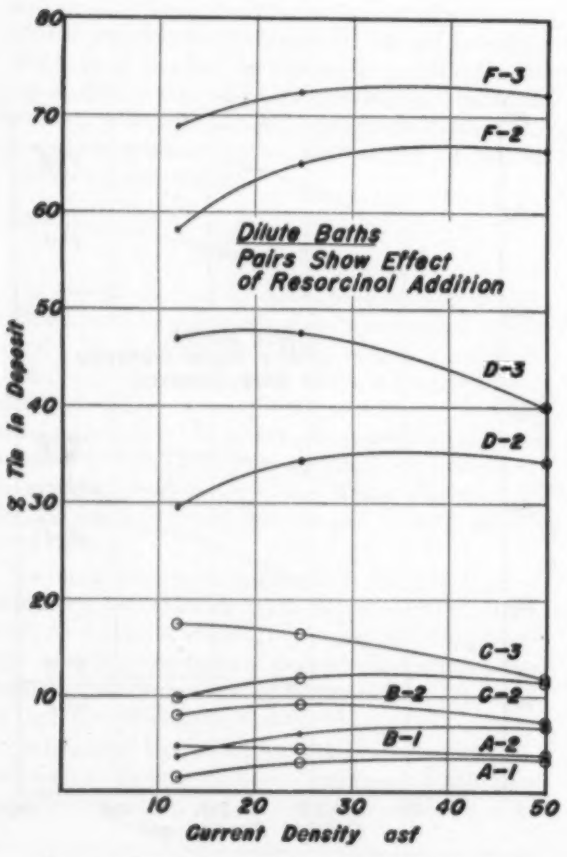


Fig. 3. Effect of Addition of Resorcinol to Bath on Tin Content of Alloy

Experimental Procedure

In this study, the alloy plating baths were made from commercial lead and tin fluoborate solutions of the following composition:

Lead Concentrate
Lead, 67 oz/gal
Free fluoboric acid, 21.5 oz/gal
Excess boric acid, 6.0 oz/gal

Tin Concentrate
Tin, 44.6 oz/gal
Free fluoboric acid, 7.6 oz/gal
Excess boric acid, 3.5 oz/gal

The concentrated solutions were analyzed for lead and tin by methods detailed in the Appendix. These solutions were then mixed and diluted to give the desired lead-tin ratio and total metal content for each bath tested. No further adjustment was made in free acid content of the solutions.

Vinyon bagged anodes used in the solutions were alloys of the same percentage compositions as the metal content in the solutions in which they were employed. Anodes were placed in the bath to plate both sides of a ¾ x 4-inch cold-rolled steel cathode, which was placed exactly at the mid point between the two anodes. Cathodes were held in a plastic rack designed to promote uniform current distribution. These steps were taken to insure that samples of the deposit taken for chemical analysis would be representative of the average composition of the deposit, and could be compared with the average composition as determined by the electrolytic method. Actual size of the cathode was 7/8 x 6 inches, but the plastic rack masked 1/16 inch on each side of the panel, and it was immersed to a depth of only 4 inches. All data presented in the graphs represent deposits plated at room temperature (70–75° F).

In this series of experiments a lead fluoborate coulometer was used to measure total current for each alloy deposit plated. This solution was a 1:2 dilution of commercial lead fluoborate concentrate, to which 0.1 g/l of bone glue was added. The coulometer was checked against an acid copper bath using reagent grade copper sulfate. Ampere hours, as determined by both methods, checked to four decimal places on three separate tests.

It will be noted in the curves that removal of metal from the solution through deposition was seldom in

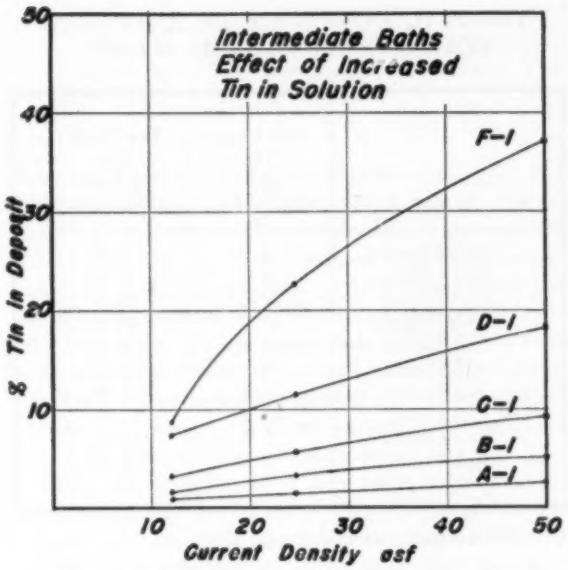


Fig. 4. Effect of Tin Content of Bath Containing 0.4 g/l Glue on Composition of Alloy

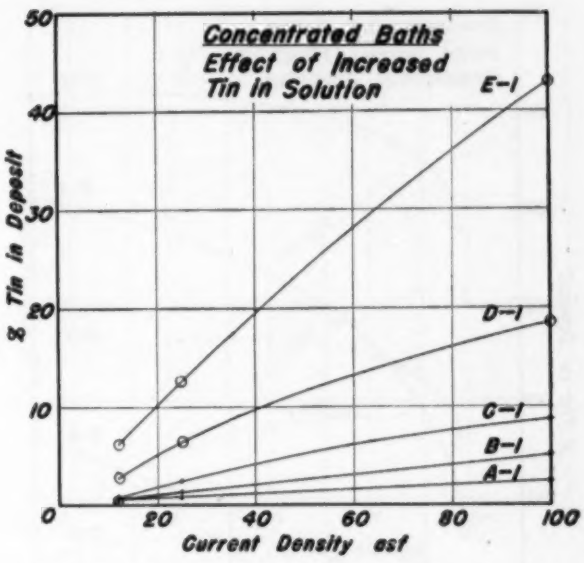


Fig. 5. Effect of Tin Content of Bath Containing 0.4 g/l Glue on Composition of Alloy

the same ratio as the original metal content. In order to minimize this change in lead-tin ratio in the solution, a large volume and a small cathode size were used. The cathodes were six square inches in effective area and were plated in four liters of solution. The following example shows the calculated variation in metal content in Solution C (dilute) over the period in which it was used; three deposits were plated in each stage.

	Start C-1	*Start C-2*	*Start C-3*
Tin, g/l.....	10.0	10.02	9.99
Lead, g/l.....	90.0	89.97	90.02

The following procedure was used in conducting each test: (1) Alloy and coulometer panels were degreased, cleaned anodically in alkaline electro-cleaner, dipped in hydrochloric acid, rinsed, acetone dipped and air dried; (2) Panels were weighed on an analytical balance to the nearest 0.1 mg, then (3) plated with the lead coulometer and the alloy plating bath in series, for 1 ampere-hour which gave a coulometer deposit of about 3.9 grams; (4) Panels were thoroughly water rinsed, acetone rinsed and air dried, then (5) reweighed and the alloy composition calculated by the following formula:

$$\% \text{ Sn} = 134.1 \left(\frac{\text{wt. coul. deposit}}{\text{wt. alloy deposit}} - 1 \right)$$

Where ampere hours are determined with ammeter and stop watch the following formula may be applied:

$$\% \text{ Sn} = \left(5.182 \frac{\text{Ampere hours}}{\text{Wt. alloy deposit (grams)}} - 1.341 \right) 100$$

Derivation of this formula is covered in the Appendix; (6) Samples of the deposit were shaved from the alloy panel using a sharp knife. Chemical analysis for tin was run on these samples. Analytical methods for the alloy plate are listed in the Appendix.

Results

The following variables were investigated to a limited extent:

Agitation. It was felt that data on the effects of

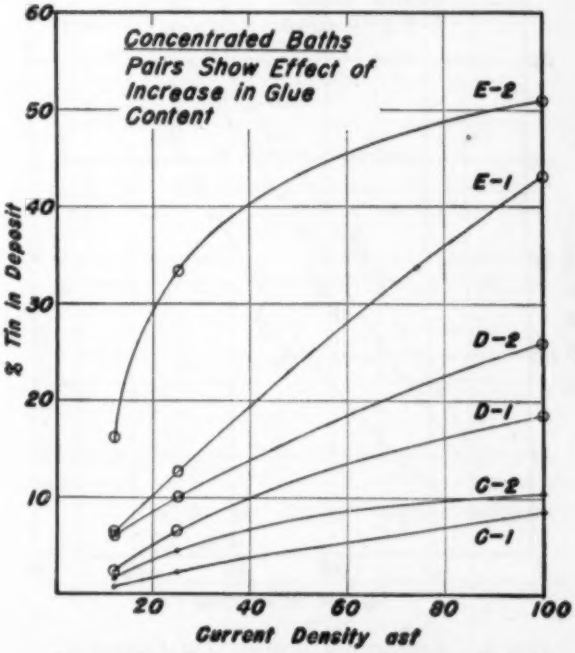


Fig. 6. Effect of Increasing Glue Concentration of Bath on Tin Content of Electrodeposited Alloy

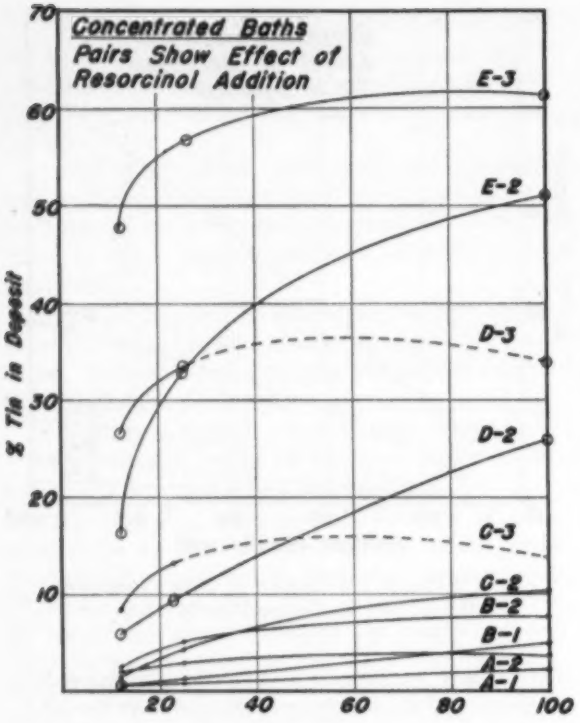


Fig. 7. Effect of Addition of Resorcinol to Bath on Tin Content of Alloy

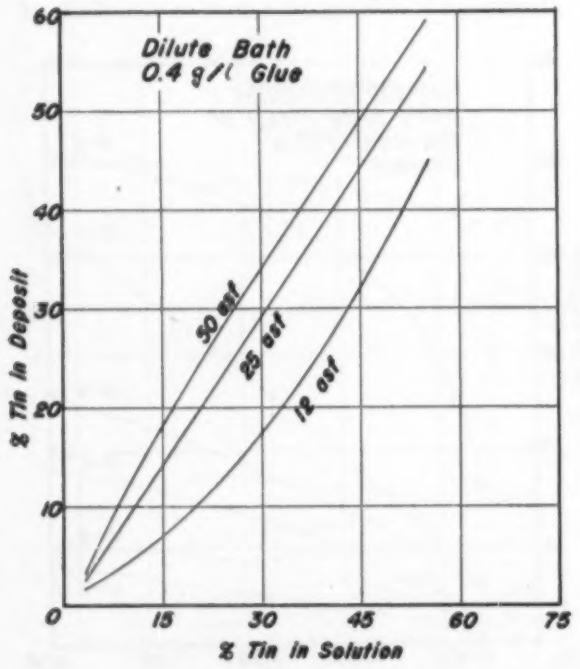


Fig. 8. Relationship Between Tin Content of Bath and Alloy Composition at Various Current Densities

TABLE II. INFLUENCE OF AGING ON TIN CONTENT OF THE ALLOY*

Solution	Per Cent Tin After Make Up	Per Cent Tin After 3 Months
A-2 Dilute	4.6	3.1
B-2 Dilute	9.1	7.1
C-3 Dilute	16.2	14.5
D-3 Dilute	47.5	49.8
F-3 Dilute	72.4	76.8
A-2 Conc.	3.1	1.5
B-2 Conc.	5.1	5.0
C-3 Conc.	13.6	17.3
D-3 Conc.	33.7	39.2
E-3 Conc.	56.8	52.6

*(All deposits taken at 25 asf)

agitation would be of doubtful value, as a given rate and type of agitation would be impossible to reproduce in a production operation. A few tests, conducted by plating on a rotating cathode, showed an increase in tin content due to agitation in some cases, and a decrease in others. The change in all cases, however, was within the limits of experimental error. Figures from the graphs give a close approximation of results, but minor variations may be expected when agitation is used.

Temperature. Changes in tin content due to temperature were within the limits of experimental error for temperatures between 70° and 105° F for 3 different solutions.

Stannic Tin Content. Tests indicated that only stannous tin was effective in the electroplating bath. Stannic tin may be ignored as far as effect on the alloy composition is concerned. By the same token, oxidizing effects in the solution should be avoided, as oxidation of the stannous tin will result in a decrease in the tin content of the alloy.

Free Acidity. As might be expected in view of the high free acidity of this solution, further increase in the free fluoboric acid had no significant effect on the alloy composition. In 2 cases an increase in free fluoboric acid from 5.0 to 10.0 oz/gal had no significant effect on the tin content of the alloy.

As is well known, the addition of glue to a fluoborate bath results in a highly turbid solution, because of the colloidal nature of the glue. It was found that the solution could be filtered to the extent that the turbidity is completely removed without decreasing the effectiveness of the glue in the solution. Treatment with activated carbon, however, removed most of the effective protein.

In Table II, results from certain baths immediately after make-up are compared to results obtained from

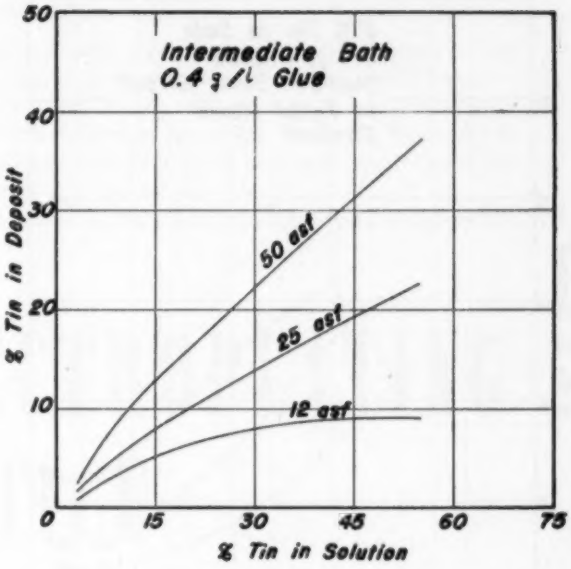
Fig. 9. Relationship Between Tin Content of Bath and Alloy Composition at Various Current Densities

the same solutions after three months of storage. It is believed that the change in the results was due for the most part to detericration of the addition agents. Deposits from the aged solutions were typified in many cases by vertical striations, a condition more pronounced in coatings from baths containing the most addition agent. It was found that solution treatment with activated carbon eliminated this effect. Striated or ribbed deposits were obtained only from solutions containing both aged protein, presumably hydrolyzed, and aged resorcinol, presumably oxidized.

Complete data relating to the major variables studied are presented in the curves of Figs. 1 through 15. The coding used on these curves is explained in Table I. While the curves are self-explanatory and should be consulted for detailed information, the results may be summarized in the following general conclusions: (1) An increase in the tin content of the plating bath results in an increase in the tin content of the alloy (Figs. 8, 9, and 10). (2) An increase in the glue content of the bath results in an increase of tin in the alloy (Figs. 2, 6, and 11). (3) Addition of resorcinol, when glue is present, results in a substantial increase in tin content of the alloy (Figs. 3 and 7). In a few tests, resorcinol alone resulted in very low tin contents in the deposit as shown in Table III. (4) When the glue content of the solution is low, an increase in current density results in an increased tin content (Figs. 1, 4, and 5). This effect diminishes with an increase in the glue content (Figs. 2 and 6), and even reverses

TABLE III. INFLUENCE OF RESORCINOL USED WITHOUT GLUE

	12 asf	25 asf	50 asf
Solution C (Dilute) grams per liter	Per Cent Tin		
0.5 Resorcinol	0.4	0.4	2.9
1.0 Resorcinol	0.4	0.4	3.7
1.0 Resorcinol + 1.0 Glue	17.6	16.0	12.4
Solution F (Dilute)			
0.5 Resorcinol	4.8	25.1	41.3
1.0 Resorcinol	6.4	26.1	41.9
1.0 Resorcinol + 2.0 Glue	68.9	72.4	72.2



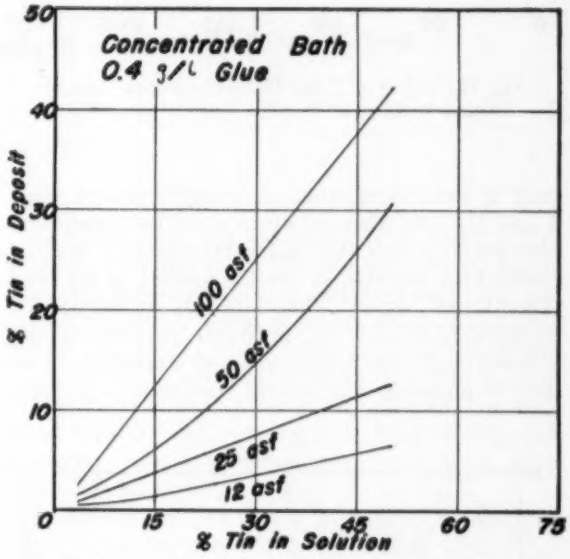


Fig. 10. Relationship Between Tin Content of Bath and Alloy Composition at Various Current Densities

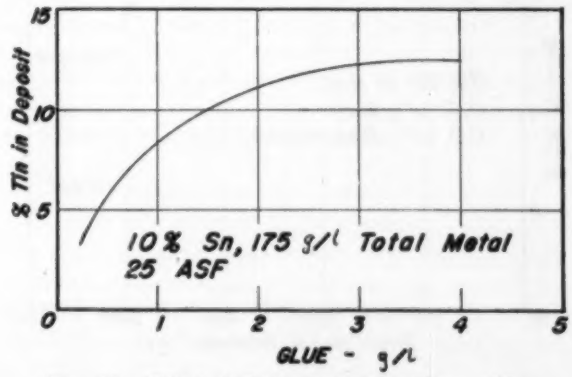


Fig. 11. Effect of Glue Content on Composition of Alloy

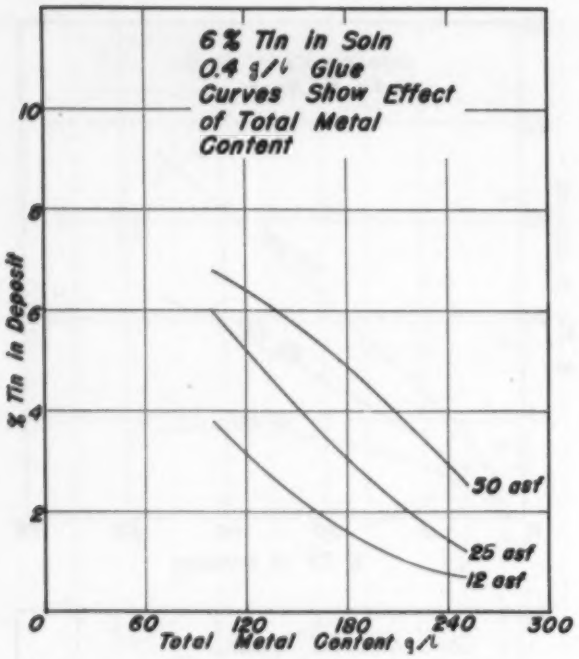


Fig. 12. Effect of Total Metal Content on Composition of Alloy at Various Current Densities

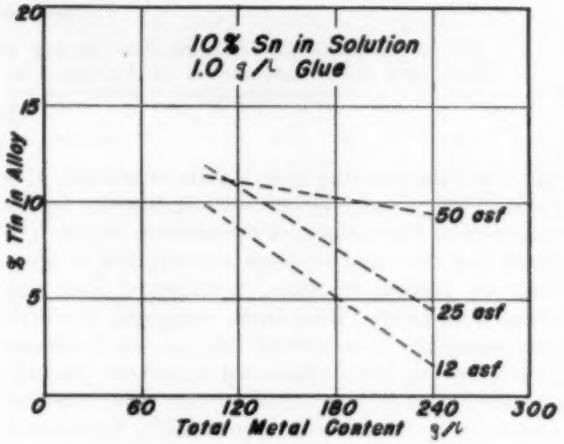


Fig. 14. Effect of Total Metal Content on Composition of Alloy at Various Current Densities

itself in some cases, when resorcinol is present (Figs. 3 and 7). (5) When all other variables remain constant an increase in the total metal content of the bath results in a decrease in the tin content of the alloy (Figs. 12, 13, and 14). The data indicate one possible exception to this rule (C-3 at 50 asf). As this exception is based on an interpolated value at a point where the slope is uncertain, the general statement is probably more accurate. The dashed lines on Figs. 13, 14, and 15 are used only to pair off related values in the dilute and concentrated baths and should not be used as curves.

An examination of the curves shows that for any desired alloy composition, several sets of conditions are applicable. As a starting point, in the dilute bath, using 0.4 g/l glue and a current density of 25 asf, the lead-tin ratio of the alloy is roughly equal to the lead-tin ratio in the solution. It should be noted, however, that the variation in composition due to current density is large in this particular bath. Thus, users will be guided in their choice of solution by the particular requirements of the job to be done and the available facilities. In plating bearings, for example, one would of necessity provide uniform current distribution to obtain uniform thickness. Variation in tin content with current density would be of little conse-

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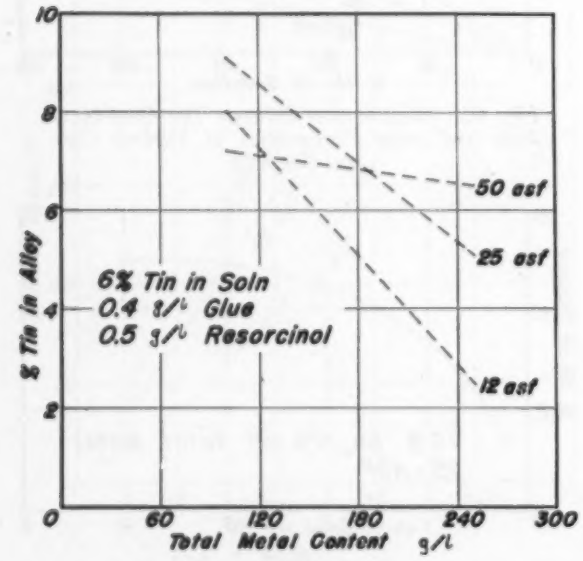

Fig. 13. Effect of Total Metal Content on Composition of Alloy at Various Current Densities

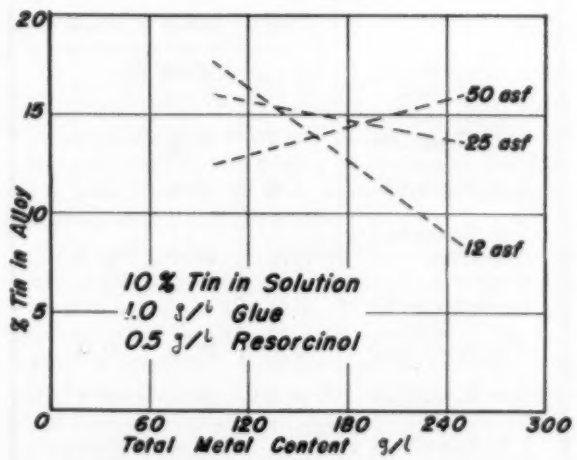

Fig. 15. Effect of Total Metal Content on Composition of Alloy at Various Current Densities

In some respects the state of development of Japanese electroplating practice is ten to twenty years behind United States practice; in other respects it parallels United States practice closely. Japanese employ the same general plating procedures used in the United States. Their needs include better cleaners, bright plating solutions, and better plating equipment. The Japanese employ certain processes not used in the United States. These include: chromium plating at room temperature; Daniell cell copper plating; oxalic acid anodizing. Electropolishing of low carbon steel, chromium steel, and brass is carried out commercially.

JAPANESE ELECTROPLATING PRACTICE

— a report —

EZRA A. BLOUNT*

Introduction

The development of Japan's electroplating industry has not been spurred, as has the electroplating industry in the United States, by the demands of the automotive and home appliance industries. These industries are not important factors in the Japanese economy. Understandably, progress of a scientific and engineering nature in electroplating has been slow during the past fifteen to twenty years, and this fact, added to metal shortages and lack of consumer demand for the products of the electroplating industry, has been a determining factor in establishing the present position of electroplating in Japan.

There has been the further disadvantage that the industry has had to depend on private or individual research for new developments in electroplating. There has not been the concentrated effort on development of new methods by supplier companies that has been the blessing of the American electroplater. Japan's suppliers seem to confine their efforts to the importation of such products as can be used, the manufacture of generators, rectifiers, and electrical equipment, the manufacture of buffs and buffing compounds, buffing and polishing equipment, tanks, and the basic chemicals without which the plating shop cannot operate. It has remained to the few universities, research organizations, and societies to conduct such research as was possible.

Notwithstanding the handicaps under which it has operated in recent years, the Japanese electroplating industry is substantial. It is estimated that there are about 3,000 plating shops, or plants with plating facilities, in Japan, and about 1,000 of these are in the Tokyo area. In 1949 approximately 25,000 persons were engaged in the industry, including platers, polishers, chemists and technical men, shop owners, and managers, and it is estimated that a great many more individuals are involved today.

Plating shops range in size from one- or two-room shops, employing two or three persons to fairly large plants occupying one or more buildings. Manufacturing plants in Japan are not the large, multi-story structures that are common in the United States, but are generally made up of several one- or two-story buildings grouped together in one area or "compound", surrounded by a wall or strong fence. In the smaller shops one of the buildings serves as the business office and the owner's home. In the larger plants, the owners do not live on the factory premises.

Summary of Polishing and Plating Operations

A brief review of some of the electroplating operations carried on in Japan will indicate that some of the methods used are quite similar to those in use in the United States; others are quite different. Another fac-

*Editor, Products Finishing Magazine.

Fig. 1. In the polishing and buffing room of the Miyata Works, Ltd., steel bicycle parts are polished, employing the following cycle: 120 emery set-up wheel (dry); 220 emery set-up wheel with tripoli as lubricant; 320 emery set-up wheel using tripoli. Polishing wheels are made by gluing buff sections together. A cold cement is used to set up the wheels. Polishing speed is 8,000 sfm. (Photo courtesy Products Finishing)

tor is that the Japanese electroplating industry, like the entire Japanese economy, is geared fundamentally to hand operation.

Metal polishing is accomplished with polishing lathes and set-up wheels, followed by buffing where such an operation is required (see Fig. 1). Backstands and coated abrasive belts are not used. Emery cake is used for lubrication and cutting during the polishing operation. For buffing, tripoli and lime buffing compounds are employed. Greaseless buffing compounds, used to produce a satin finish, are rarely employed.

Cleaning is done by means of trichlorethylene degreasers, with hot caustic solutions (see Fig. 2), or by means of soap solutions and hand scrubbing with a type of pumice (see Fig. 3). These operations may be combined to produce the desired results, or may be used in connection with various pickling operations either before or after the cleaning operation proper. One great need of the Japanese electroplater is a counterpart of the modern, American well formulated cleaner, which has been designed for a specific purpose.

Pickling, acid dipping, or bright dipping operations are carried out with hydrochloric, sulfuric, phosphoric, and nitric acids. In bright dips for brass and aluminum, phosphoric acid is favored over sulfuric as one of the ingredients.

Metals deposited include: copper, brass, nickel, zinc, cadmium, chromium, silver, tin, gold, black-nickel, iron, and lead. Although automatic plating machines are quite rare, barrel-copper, cadmium, zinc, nickel, and chromium plating is carried out, as well as periodic-reverse-copper plating, indicating that some of the more recent developments are being adopted. Aluminum anodizing is performed by the sulfuric acid process or by an oxalic acid process[1]. Electropolishing of brass, carbon steel, chromium steel, and aluminum—also chemical polishing of aluminum—is done. Metal coloring to obtain many interesting effects on electroplated products is an ancient art in Japan and is still carried on extensively.

A review of some of the applications for electroplating in Japan will furnish a better background from which to examine the industry in general and detailed processes in particular. Copper-nickel-chromium, brass-nickel-chromium, or copper-chromium bright finishes are used on automobile, truck and bus parts, sewing machines, bicycles, electric irons, umbrella stems, clock parts, and similar products for export or domes-

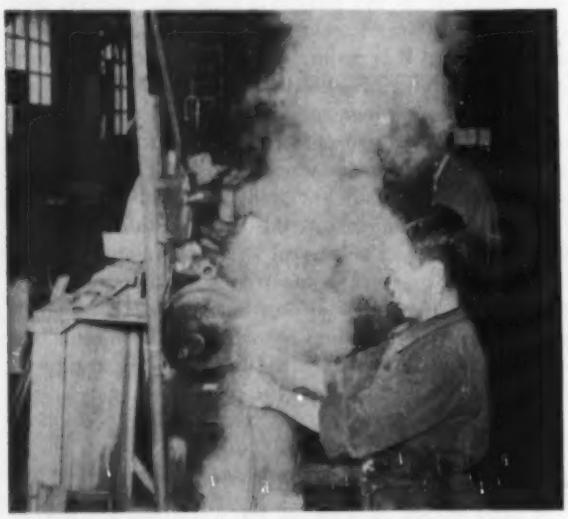

Fig. 2. Cleaning lead antimony slush castings in the plant of Yamato-Gumi. The operator in the foreground has just removed a basket load of parts from the hot alkali soak cleaning tank. The tank, which is kept covered except when loading and unloading, is heated with charcoal

Fig. 3. Lead antimony castings, alkali cleaned, are rinsed and scrubbed in wood tubs filled with water, using a fine abrasive powder resembling pumice. They are then racked for copper plating

tic use. Zinc and cadmium are applied to steel for corrosion resistance, and in a few installations, a chromic acid type bright dip is used after zinc plating to produce a bright finish resembling chromium. Copper and chromium are deposited on printing rolls for color printing; iron and copper are deposited in electroforming printing plates. Hard-chromium plating on dies, journals, shafts, either to obtain increased service life or as a repair procedure, is carried on in about the same way it is in the United States. Anodized aluminum, with or without dyed or lacquer finishes of various kinds, is used extensively in the production of aluminum kitchen utensils, trays, and aluminum communication equipment. Silver and gold plating of jewelry products, brass cosmetic cases, and other luxury items for export are carried out. Electropolishing of brass followed by gold plating is used on some of the elements of telephone receivers. Electropolishing of carbon steel clock pins and straight chromium steel turbine blades is being accomplished[2]. Aluminum reflectors are being produced by electropolishing and anodizing.

Generally, bright plating solutions are not in use in Japan. Conventional cyanide solutions for plating brass, copper, zinc, cadmium, silver, and gold are employed. Copper is also plated from acid solutions, and in the Daniell cell, in which no outside source of electric current is used. The Watt nickel solution is used generally, and either the 21 Baumé chromium solution containing sulfate in the ratio of 100/1, or a room temperature chromium solution employing ammonium fluoride is used for depositing chromium. A fluoborate copper solution in an electrotyping plant, and both lead fluoborate and lead sulfamate solutions in a refining plant are examples of other solution types that were observed being employed.

There are burnishing barrels in use, but barrel finishing is not well developed. Electricity is more readily available than any other form of power, and that fact dictates the choice and design of equipment. Equipment for electroplating is adequate to handle the solutions and the methods employed. Generally, steel or wood tanks are used. Some steel tanks are lined with lead where such is necessary. Nickel plating tanks are usually made of wood and lined with pitch. Concrete tanks, lined with lead or pitch, are used in the larger anodizing shops. Rubber or plastic tank linings are not available; neither are plastic rack coating materials. Solutions are heated by electric immersion heaters, steam coils, coal, or charcoal. Since heat in factories is not general, tank heating becomes a difficult matter. Power for plating is supplied by motor-generator sets (see Fig. 4), selenium rectifiers, or mechanical rectifiers. It is quite common for each plating shop to install its own private transformer station. This is an added expense to the electroplater. Solution maintenance is not a strong point with Japanese electroplaters partly by reason of the slow speeds of plating, and the kinds of solutions used. There are

Fig. 4. A view of the well-arranged generator room at the Iwasaki Communications Manufacturing Company, Ltd.

some solution filters and a few resin demineralizers to purify the water for precious metal plating. A few centrifugal dryers, electrically heated, are in use.

Room Temperature Chromium Plating

During the course of the author's term of service in Japan, it was his privilege to visit a number of electroplating plants and factories with electroplating departments. The practices and equipment noted in a few of these will be outlined to serve as illustrations of general conditions existing in the Japanese electroplating industry.

One solution not used in the United States, which is used to a considerable extent in Japan, is the room temperature chromium plating solution. This bath was observed in operation at both the Tokyo and Matsumoto plants of the Miyata Works, Ltd.[3] (see Fig. 5) and at the Toyo Dento K.K. (The Oriental Electroplating Company). At the Miyata plant steel bicycle parts are polished, brass and nickel plated, and then chromium plated for two to three minutes in the following solution under the operating conditions noted:

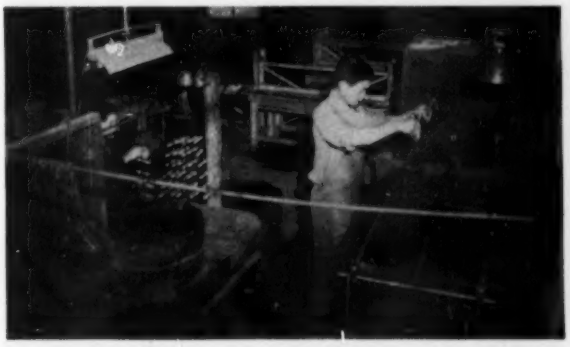

Fig. 5. Steel bicycle parts, previously brass and nickel plated, are chromium plated at room temperature in the Tokyo plant of Miyata Works, Ltd. Lead anodes containing 4 per cent antimony are used; the tank is steel, unlined. A 300 ampere, 10 volt rectifier (right background) furnishes power for the operation. (Photo Courtesy Products Finishing)

Fig. 6. One of the room temperature chromium plating tanks in the plant of Toyo Dento K.K. The tank is steel, unlined and lead antimony anodes are used. Racks used for chromium plating are insulated with a solution of celluloid in amyl alcohol, and with vinyl chloride tape

Chromic acid	33.5 oz/gal
Chromium sulfate	0.2 oz/gal
Ammonium fluoborate	0.8 oz/gal
Temperature	77° F
Voltage	4.5 volts
Current density	50 to 70 asf
Anodes	lead, 4 per cent antimony
Anode to cathode ratio	3.5

A thickness of 0.00002 to 0.00005 inches is obtained. Parts to be plated in this solution are nickel buffed with a white lime composition, wiped with dry chalk, racked or wired, dipped in 10 per cent sulfuric acid, water rinsed, and then chromium plated. Following plating, work is rinsed in a concentration or dragout rinse, and then in clear water.

Fig. 7. Small parts for clocks are barrel nickel plated and then barrel chromium plated 10 minutes in the Seikosha Works. The drive motor for rotating the barrel at 2 rpm can be seen in the center background, and, in the right foreground, can be seen the down-draft exhaust

The development of the room temperature chromium plating solution is attributed to the late Yoshio Koshino[4], and has been described also by Dr. Sakae Tajima[5,6]. Two general types of solution are recommended, with variations of each being employed by various shops to suit their own conditions. The two types of solution are:

Chromic acid	33.5 to 40.0 oz/gal	48 oz/gal
Ammonium fluoride	0.4 to 0.8 oz/gal	0.8 oz/gal
Chromium sulfate	none	0.2 oz/gal

The solution containing ammonium fluoride only is said to produce a deposit with a dark luster suitable for some special purposes, while the solution containing both ammonium fluoride and chromium sulfate produces the bluish chromium deposit suited to general use. A solution with a higher chromic acid concentration exhibits less tendency toward burning and produces a brighter deposit.

In the plant of the Toyo Dento K.K. such items as gasoline tank caps, umbrella stems, builders' hardware, and automobile bumpers are chromium plated by this method. The solution used at Toyo Dento is as follows:

Chromic acid	32	oz/gal
Sulfuric acid	0.33	oz/gal
Ammonium fluoride	0.54	oz/gal
Current density	50	asf
Voltage	4.5	volts
Temperature	80°	F

Plating is carried out in a plain steel tank (see Fig. 6) and lead anodes containing 10 per cent antimony are used. Advantages of the low temperature plating process, as outlined by Toyo Dento officials, include the fact that the low current density favors plating shop operation during periods when electric power is restricted. Since nickel is so limited, very little nickel is applied and the lower current density in chromium plating prevents peeling of the nickel plate, which might otherwise be experienced under such conditions. Job plating shops with varied production also find the improved throwing power of the low temperature solution advantageous, since auxiliary anodes are required less frequently.

Barrel Chromium Plating

Barrel chromium plating is being accomplished in one plant of the Seikosha Works, largest clock manufacturer in Japan. Small steel clock parts of various kinds are first barrel nickel plated and then chromium plated in the barrel shown in Fig. 7. The solution used is chromic acid, 50 oz/gal, and sulfuric acid in the ratio of 100/1. Plating is carried out at 350–400 amperes for a seven-pound load, ten volts, and a temperature of 115° F. The barrel, which rotates at two rpm, is made

of nickel chromium steel. The plating tank is steel, glass lined, and is jacketed with a water jacket fitted with steam coils.

As a matter of information, a barrel chromium plating process to be operated at 80 to 90° was developed by Yoshio Koshino, and has been reported in the literature[7]. This solution contains chromic acid, boric acid, and ammonium fluoborate.

Hard Chromium Plating

Hard chromium plating on camera parts, steel molds for the plastics industry, steel rolls for rubber mills, wire drawing dies, paper drying rolls, diesel engine crankshafts, pipe forming mandrels, dies for steel extrusions, and similar applications, is accomplished in the plant of Koka Chrom, a leading hard chromium plater in the Tokyo area. The solution used is the conventional bath containing 33 oz/gal chromic acid and 0.33 oz/gal sulfate, operated at 130° F. Articles to be plated are cleaned by vapor degreasing, immersed in the solution and treated anodically for five to fifteen minutes. Plating is then accomplished in the normal manner at 250 to 500 asf for a sufficient length of time to produce the desired thickness. Koka Chrom officials stated that in some cases plating thicknesses of 0.01 inch were being deposited. Although the plate is fairly bright, it is buffed with green chrome rouge, in some cases, to produce a smooth surface.

Lead lined, steel plating tanks are used, and these tanks are insulated to minimize heat loss. Electric immersion heaters maintain operating temperatures. Plain steel anodes, shaped as required, are employed. The iron content is controlled by electrolyzing the solutions, employing a cathode in a porous cup, when the plant is not in operation. Ferric hydroxide is formed at the cathode and retained in the cup. Some idea of the size of the plant may be gained from the fact that there are eight large chromium plating tanks installed, and the generator capacity is over 8,000 amperes.

Daniell Cell Copper Plating

Daniell Cell acid copper plating seems to be well suited for copper plating lead antimony alloy slush castings which, when complete, form cigarette cases, ash trays, jewel boxes, powder boxes, candy dishes and similar items. Advantages cited for the process include the claim that the copper is deposited uniformly all over articles of intricate shape, and that as much as four times the quantity of work can be plated in a tank at one time as could be plated in a conventional acid copper solution.

In the Yamato-Gumi plant, the lead antimony castings are buffed, soak cleaned in a hot solution containing 10 per cent sodium hydroxide and 1 per cent of a mixture of sodium silicate, soda ash and rosin (see Fig. 2). They are then rinsed and hand brushed with a fine powder resembling pumice (see Fig. 3). Racked on simple contact racks insulated with celluloid tubing, the castings are flashed in cyanide copper and hung in the Daniell cell copper plating tank (see Fig. 8).

As can be noted, the "cathode" rods are located along both sides of the tank, and the "anode" rod is located in the center. Cross bars connect the anode bar with the cathodes. The plating solution is an acid solution of copper sulfate of about 20° Baumé density. The skin membrane bags in the center of the tank contain a dilute solution of sulfuric acid. Zinc metal is hung inside the skin bags and connected electrically to the "anode" rod. As the zinc dissolves in the sulfuric acid, electrical energy is generated which causes the copper to be deposited on the articles hung on the "cathode" bars. A plating time of from five to twenty hours is employed. In twenty hours a plate thickness of approximately 0.0005 inch can be produced.

Electropolishing

The electropolishing installations visited in Japan were comparatively small and specialized in their work. In the Seikosha Works, previously mentioned, carbon steel clock pivots and small screws are electropolished in a perchloric-acetic acid solution developed by Jacquet. The laboratory scale setup (see Fig. 9) consists of three one-gallon glass tanks fitted with exhaust hoods. Glass cooling coils around the inside of each tank hold temperatures below 86° F.

Pivots and screws are cleaned by tumbling in wood powder, racked on small spring-type racks, and electropolished for ninety seconds. They are then rinsed in hot water containing 3 per cent oxalic acid and dipped in a petroleum base corrosion inhibitor.

One of the two job shops in Japan organized to perform electropolishing exclusively is Nikko Kinzoku-Kagaku K.K. Here, 13 per cent chromium steel turbine blades, bobbins for the textile industry, and similar products are processed. The articles are given a

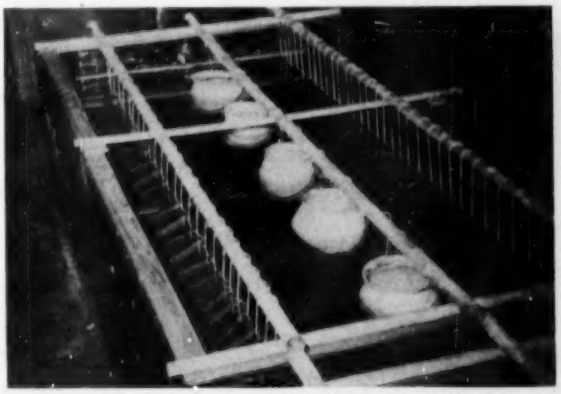

Fig. 8. A view of one of the eight Daniell Cell acid copper plating tanks in the Yamato-Gumi plant. Castings are cyanide copper flashed and then plated 5 to 20 hours in this solution. Electrical energy is generated in the tank and no external power is employed. The plating tank is wood, insulated inside and out with asphalt

Fig. 9. In the plant of the Seikosha Works carbon steel clock pivots and small screws are electropolished for 90 seconds in a mixture of perchloric and acetic acids. Exhaust hoods are mounted over the small tanks. A 40-volt rectifier furnishes power for the installation

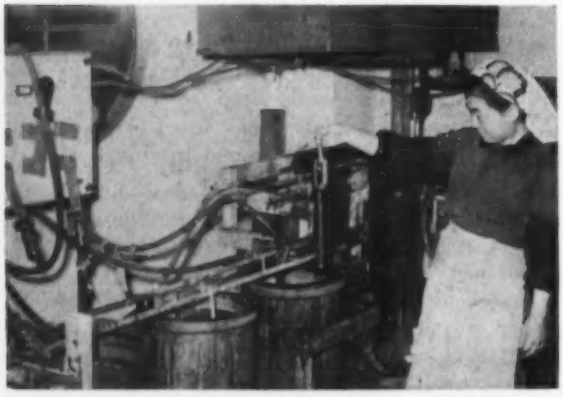

Fig. 10. A view of the electropolishing installation in the Nikko Kinzoku-Kagaku K.K., one of the two electropolishing job shops in Japan. Chromium steel turbine blades, bobbins for the textile industry, and similar products are electropolished in a phosphoric-sulfuric-chromic acid solution

Fig. 11. In the communications industry the oxalic acid anodizing process is employed to impart electrical resistance to aluminum surfaces. These telephone parts are being anodized in oxalic acid in the Iwasaki Communications Manufacturing Company, Ltd. plant. The parts are anodized and sealed—not dyed

preliminary polishing with 200 emery, and then racked on stainless steel racks fitted with brass hooks for electropolishing.

Parts are electropolished for one to seven minutes in a solution of:

Phosphoric acid (1.95 sp. gr.)	5 parts
Sulfuric acid (1.80 sp. gr.)	4 parts
Chromic acid	1 part
Water—less than 5 per cent by volume	

The solution is operated at 210 to 250° F in heat-resistant, acidproof crocks, as shown in Fig. 10. A current density of 150 to 400 asf at 20 volts is employed. The president of Nikko Kinzoku-Kagaku reported that the electropolishing solutions had been used for three years. Additions of sulfuric, phosphoric, or chromic acids are made periodically as each solution requires.

Anodizing

The anodizing of aluminum kitchen utensils and similar products forms a substantial section of the finishing industry in Japan[1]. In Japan very thin metal is used for kitchenware, and anodizing is used to minimize corrosion and abrasion of the article, and is also used as a strong sales point. The yellow color is used to identify good quality ware. Dr. Sakae Tajima has reported[2] that there are about 100 job anodizing shops in the country in addition to some 200 manufacturers of aluminum ware who have large anodizing installations in their plants. Anodizing solutions of sulfuric acid or oxalic acid are employed. The film formed by the sulfuric acid process is preferred for articles which are to be dyed, and the oxalic acid process is used for

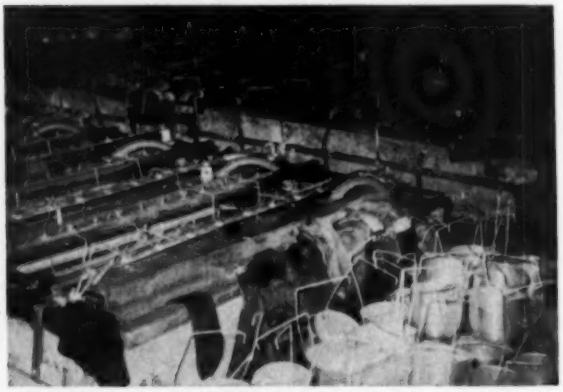

Fig. 12. A view of one portion of the anodizing department of Nasu Aluminium Industry Company, Ltd. The tanks are concrete, lead lined. When large kettles (right foreground) are anodized, separate cathodes must be used. The regular graphite cathodes are fitted with shields and a baffle arrangement to catch drops of sulfuric acid which rise from the solution on hydrogen gas bubbles

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Solid Materials
Surface Feet Per Minute: wheel diameter
rpm
Buff Numbers:
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2 pocket
3 loose
4 sisal
5 spiral sewed
SET up WHEEL
COLORING SATIN FINISH
COLORING MIRROR FINISH
BUFFING AUTOMATIC
BUFF by SFPM
BUFFING HAND
ALUMINUM
ZINC PLATE
TIN PLATE
SILVER PLATE
NICKEL PLATE
LEAD
GOLD PLATE
COPPER PLATE
CHROM PLATE
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Technical Service Data Sheet

Subject: HOW *GRANODIZING* PROTECTS STEEL DRUM SURFACES FROM RUST AND IMPROVES PAINT ADHESION

NEW DEVELOPMENT IN CONTAINER INDUSTRY

United States Steel Products Division, United States Steel Company is now producing grease-free, scale-free, rust-inhibited steel drums. A chemically clean metal surface plus a "Granodine"* non-metallic zinc phosphate coating insures maximum finish durability and underpaint rust-resistance. *Trade Mark Reg. U.S. Pat. Off.

ORDINARY PAINTED DRUM after a year of exposure to weather is badly rusted. Rust was very apparent after only one week.

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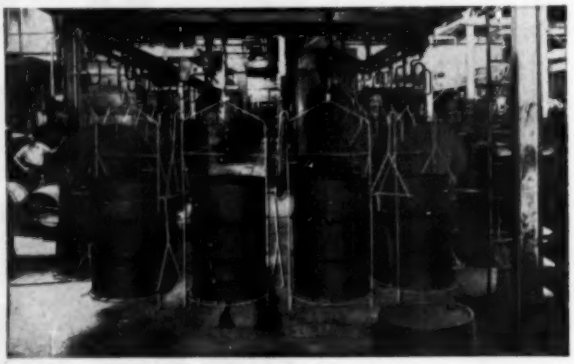
4. Acidulated rinsing in "Deoxylyte" solution



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They are chemically clean, "water-break free" inside, free of contaminating residues such as grease, oil, drawing and stamping compounds. When the familiar handkerchief test is applied to United States Steel Products' containers processed by their new finishing technique, no contamination of any kind is left on the cloth.

They are free of mill-scale. United States Steel Products is the first steel drum manufacturer to remove harmful mill scale completely ahead of the zinc phosphate coating stage.

They are rust-inhibited with a zinc phosphate-coating. These new steel drums have the added advantage of a non-metallic, paint-bonding "Granodine" zinc phosphate coating. This has been standard practice for many years in the automotive and appliance industries for long-lasting paint protection and metal preservation.

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articles to be finished in the clear anodic coating (see Fig. 11).

Generally, in the oxalic acid process, the electrolyte is 2-6 per cent oxalic acid, and anodizing is carried out in an asphalt-lined tank. The solution is circulated through another tank for cooling. Aluminum parts are anodized at about 10 asf current density and from 60 to 100 volts a.c. for forty minutes. The a.c. is superimposed on 15 to 30 volts d.c. in many cases.

In the operation of the sulfuric acid process, 15 per cent sulfuric acid at a temperature of 77° F is used. The tank is usually constructed of concrete, asphalt or lead lined. Cooling water is circulated through lead coils in the tank for cooling. Current density is 10 asf at 15 volts d.c.; anodizing time is forty minutes. Parts anodized by either process are steam sealed at 70 to 75 psi for twenty to thirty minutes.

At Nihon Alumilite Company buffed aluminum lunch boxes, canteens, trays, and kitchen utensils are prepared for anodizing by the following process:

1. Degrease in 5 per cent sulfuric acid at 175° F.
2. Water rinse.
3. Dip in 5 per cent potassium dichromate, acidified.
4. Water rinse.

Following a sulfuric acid anodizing operation (see Fig. 12), parts are rinsed in cold water, dyed for one minute in a hot solution of Japanese tea, rinsed (or dyed), dipped in 2 per cent potassium dichromate, rinsed in hot water, and steam sealed. Many interesting effects are obtained by dyeing and airbrushed lacquer designs (see Fig. 13). Following steam sealing (see Fig. 14) and final lacquering, if utilized, products are buffed lightly to impart a gloss to the surface (see

(*Continued on page 497*)

Fig. 13. Anodized aluminum lunch boxes are dyed the favored light yellow color by 1-minute immersion in a hot tea solution in the Nihon Alumilite Company plant. Then the interior surfaces are dyed bright red, blue, or any desired color by mounting the boxes in pairs on a suction plate covered with soft rubber. A vacuum line holds the articles on the plate while dyeing is accomplished. The rubber prevents leakage of the dye solution to the inside of the lunch box

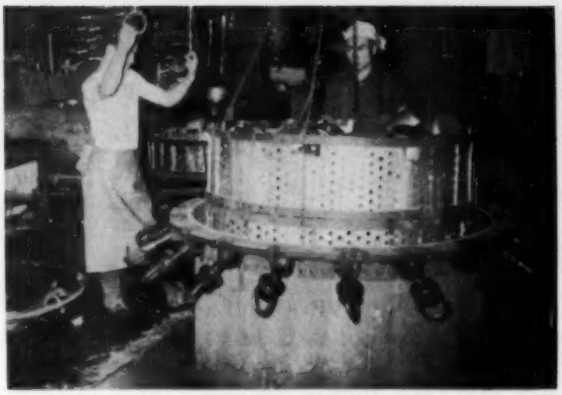

Fig. 14. Following anodizing and dyeing, aluminum articles are sealed in steam at 75 psi. This is a view of one of the three autoclaves in the plant of Nasu Aluminium Industry Co., Ltd.

Fig. 15. A view of the color buffing line in the plant of Daito Kinzoku K.K. After steam sealing and lacquering, aluminum products are buffed lightly on loose buffs, using a lime compound

Fig. 16. A view of the well-arranged plating department in the plant of Iwasaki Communications Manufacturing Company, Ltd. The tanks shown are steel, asphalt lined, and are used for nickel plating

A.E.S. FOR ELECTROPLATERS OR METAL FINISHERS?

LEONARD WEEG*

IN 1909 CHARLES PROCTOR and a group of interested men recognized the need for an organization to increase and spread the knowledge of electroplating and other metal finishing operations. From this early group came the American Electroplaters' Society whose objective is stated clearly in the Constitution, as follows, "The object of the Society shall be the improvement and dissemination of the knowledge of the arts and sciences of electroplating and of finishing of metals and of allied arts, the development of a cooperative spirit of friendship and mutual assistance among its members".

This objective clearly and precisely sets forth the needs in the metal finishing industry—whether or not the American Electroplaters' Society will embark upon policies designed to meet these needs is the decision facing the group now. The future status of the Society depends upon this decision.

It is a matter of record that up to the present time the Society has been chiefly concerned with fulfilling only that part of its objective having to do with electroplating. Let one look at the record. The name of its journal is PLATING. Last year, PLATING contained approximately 261 pages of editorial matter. Of this total, 98 pages were concerned either with plating processes or closely allied subjects such as physical properties of deposits, corrosion testing of deposits and testing procedures for solutions. The research program contributed about 140 pages of editorial matter, making a total of 238 pages of editorial matter devoted to plating and closely allied subjects. The remaining 23 pages were distributed as follows: galvanizing 3, barrel finishing 5, sales promotion 1, general finishing stories 8, buffing 3, organic finishing 3.

The Editorial in the November, 1952 issue of PLATING was captioned "For the Advancement of the Science of Electroplating". This editorial urged "seasoned campaigners along with newcomers to the field, both young and old, to take up their pens and in submitting manuscripts do their bit for the advancement of the science of electroplating". The Editorial in the February, 1953 issue of PLATING urged all members to do their part to help increase membership and made this comment: "Perhaps you—as a member of the Society—have never thought to ask your electroplater friend to join".

Thus one sees why the Society clearly deserves the name applied to it countless times—"The Platers' Society". It has gained this name because it focused its attention on electroplating. The Society has done a good job "in the improvement and dissemination of the knowledge of the arts and science of electroplating". The Research Program of the Society is an activity of which it can well be proud. However, it is the author's feeling and the feeling of others, that many of the problems of the A. E. S. can best be solved by a true fulfillment of its stated objective.

Increases in membership, in manuscripts for publication, in support for the Research Program, in advertising, and in participation in the Industrial Finishing Exposition can most easily be achieved by broadening the scope of its interests to include all phases of metal finishing.

"The Iron Age" in its Metal Industry Facts for 1952, set forth these data collected from United States metal working plants employing 20 or more plant workers:

	Departments operated
Washing or Degreasing	6033
Polishing or Buffing	5412
Painting and Lacquering	8619
Electroplating	2818

Now compare editorial matter appearing in all issues of PLATING for 1952:

Polishing or Buffing	3 Pages
Painting and Lacquering	3 Pages
Electroplating	238 Pages

These data indicate the tremendous possibilities for the Society in the field of metal finishing. The need for the A. E. S. to do the kind of work in polishing and buffing, in painting and lacquering, as it has done in electroplating is obvious to anyone concerned with these operations. The data indicate more people are concerned with these operations than are concerned with electroplating. Will the Society meet their needs?

It is the writer's belief that the A. E. S. must meet their needs. If it is to continue to sponsor an Industrial Finishing Exposition and to solicit advertising for plating in the general field of metal finishing—and the author believes it should do both—then it must fill the needs of all branches of metal finishing. The American Electroplaters' Society was founded with that objective. Its policy should provide for achievement of the complete objective!

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CLEANING AND PREPARATION OF METALS FOR ELECTROPLATING

VI. SENSITIVITY OF DEGREASING EVALUATION TESTS

SUMMARY

Essentially uniform oil films are deposited on steel surfaces. The sensitivity of degreasing evaluation tests is: atomizer > spray-pattern (water-break) > fluorescent dye > potassium ferricyanide paper and copper sulfate dip. Additions are made to wettability theory: (a) sensitivity correlates with oil spreading rates, (b) wetting is determined by the number of molecules present rather than the mass or thickness of the film, (c) with mineral oil-fatty acid mixtures wetting is not an additive property (a new theory having been developed). The effect of surface preparation on wetting is reported. The results are correlated with experiments on (a) Langmuir-Blodgett multilayers and (b) dropwise condensation phenomena.

OBJECT

The object of this phase of the project is to compare the sensitivities of various degreasing evaluation tests when oil residues are present as uniform films (as contrasted to the oil distribution present in "Sequential Testing" experiments, reported previously, which was in the form of discreet droplets).

1. INTRODUCTION: THE PURPOSE OF DETERMINING SENSITIVITY

In a previous project publication[10a,b] the sensitivity of various degreasing evaluation tests was determined when the residual oil was present as discreet globules, this being the case if oil removal is accomplished by alkaline cleaning. However, in many cases of industrial interest, plating failures may occur because of the presence of thin, more or less uniform, films of oils. For example, solvent treatments generally result in the formation of such films. The relative merit of the various degreasing evaluation tests may not necessarily be the same for these two different types of oil deposits. This part of the research was therefore undertaken in order to determine the sensitivity of degreasing evaluation tests when thin oil films are present and to make a comparison with results previously obtained using a different type of residual oil distribution.

It should be remembered that only relative values of sensitivity of degreasing evaluation tests, were determined previously in "Sequential Testing",[10a,b] as the value obtained depended on the test panel area. When testing uniform oil deposits, on the other hand, it is possible to arrive at absolute values of sensitivity.

2. EXPERIMENTAL

(a) *Equipment and Chemicals*

In order to apply drops of carbon tetrachloride to metal surfaces, a 1 ml pipette, graduated to 0.01 ml is used. This pipette is attached to a glass stopcock by means of rubber tubing, the stopcock being surmounted by a rubber bulb of about 1 ml capacity, used to fill the pipette. After filling the pipette with test solution, the stopcock is closed, and the bulb removed. A screw clamp on the rubber tubing is closed. Then, the stopcock is opened, and the screw clamp is gradually opened until

TABLE I. TEST SOLUTION CONCENTRATIONS

Code	Mg of oil Weighed	Total ml of CCl_4 used to Dilute oil	Number of Dilution Stages
A	100	10	1
B	100	100	1
C	10	100	1
D	100	10,000	2
E	10	10,000	2

the desired rate of flow is obtained. Appendix (a) contains details on the effect of temperature, drop rate, and location of meniscus in the pipette on drop size. Only temperature was found to have an important effect. The drops are about 0.008 ml each.

The stearic and oleic acids and the tristearin used were cp chemicals. The specifications for the other commercial oils used were given previously[109d].

(b) *Procedure*

Fairly uniform oil films are deposited on metal surfaces by dissolving a weighed amount of oil in a measured amount of solvent, such as carbon tetrachloride, and then applying drops of solution (of known volume) to the metal surface. In order to determine the oil concentration, the surface area covered by the carbon tetrachloride drop prior to evaporation must be known. In order to do this, six ¾-inch diameter circles are etched onto the surface, and then, when applying a drop of test solution to the surface, the panel is tilted to allow the drop to revolve freely about the circled area on the panel, until complete evaporation of the solvent occurs, in order to obtain as uniform a deposition of oil as is possible. This method is not very successful if the oil concentration greatly exceeds 10^{-6} g/cm². This method of oil application was used in the early work of Devaux[819] in this field. Devaux used a glass rod to distribute the drop on a predetermined area. It was found, however, that the glass rod scratched the surface lightly, and to avoid any such extraneous effects as this, the tilting method was used to distribute the drop. Devaux states that the oiled surfaces must be heated to prevent oil removal in testing. This is objectionable because of oil evaporation and spreading effects. The authors were careful to conduct their runs in such a way as to minimize oil removal and in none of the runs was oil detected more than 1/16 inch away from the ¾ inch diameter oiled circles. Thus, the heating step was avoided. Five test solutions were prepared (Table I), each having ten times less oil than the previous one, going from solution A to E. As three panels are employed in each run, a 1000 fold oil concentration range is investigated in each run. In order to provide a suitable number of intermediate steps, six circles were present on each panel, containing 1–10 oil drops per circle (Fig. 1). Further details on the preparation of the test solutions will be found in Appendix (b).

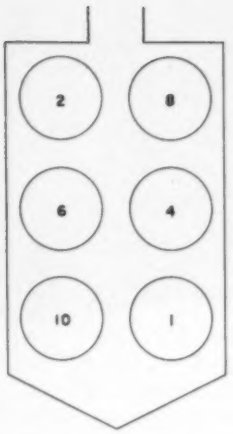

Fig. 1. Distribution of Carbon Tetrachloride Drops on the Test Panel

The surfaces used in these runs consisted of SAE 1010 cold-rolled steel, with either matte or polished finishes. Finish and steel specifications have been given previously[109d,109i]. Three surface treatments have been applied: benzene drying, heat tinting, and passivation (see Appendix (b) for procedure and details). Corrosion of clean (i. e., un-oiled) steel is a problem in these runs. One way of mini-

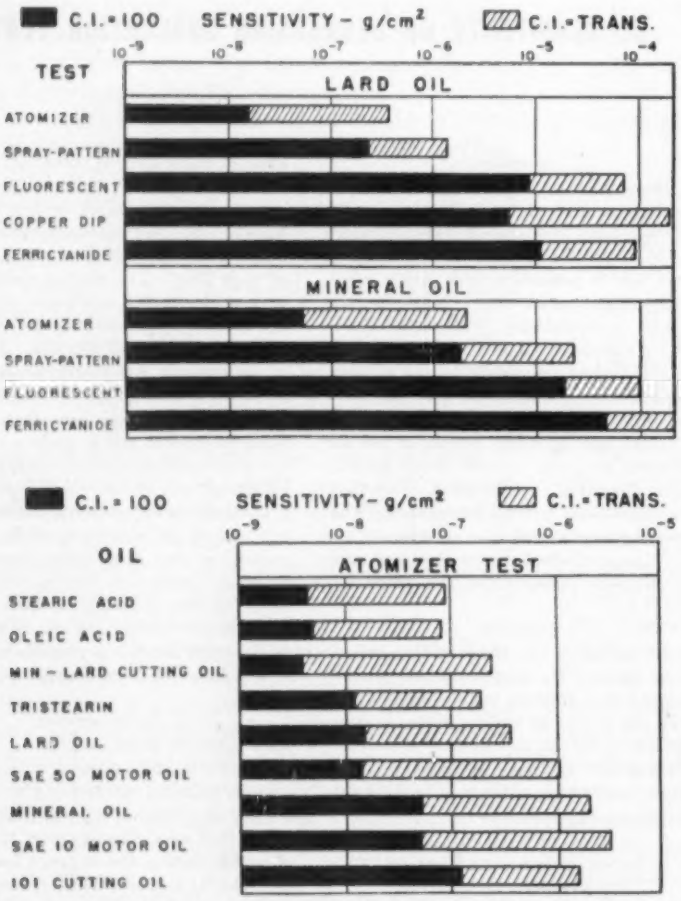

Fig. 2. Sensitivity of Degreasing Evaluation Tests: (top) Sensitivity of Various Tests for Lard and Mineral Oils; (bottom) Sensitivity of the Atomizer Test for Various Oils

mizing the growth of surface films is to clean, pickle, rinse, and dip in alcohol and benzene. When the panel dries, very little water is present, and surface film build-up is slight. Unfortunately, the evaporation of solvent will leave traces of oil behind on the surface. These residues were found to be insufficient to affect the tracer, chemical, and water-break tests, but to affect slightly the atomizer test. The only practicable way to remove these oil traces is to heat the panel lightly in a bunsen flame until the first blue oxide interference color (about 700 Å thick) covers the surface. The other way to prevent rusting is to passivate the surface using an alkaline chromate dip.

(c) *Recording of Results*

Water-break (spray-pattern). Water from a wash bottle is allowed to flow down the panel, which is held at an angle of 45° from the vertical, until the panel is flooded. The cleaning index[103] is observed visually one minute later, either with or without supplementary spraying. The sensitivity is recorded as the point where the cleaning index = 50 (Appendix (d)).

Atomizer. The panel is sprayed under standard conditions[103]. If all the oiled circles appear alike, and contain very small water droplets, C.I. = 0, while if they are all alike but indistinguishable from the background, C.I. = 100. If the appearance of the oiled circles changes progressively with oil concentration, ranging from small water droplets to flat patches of irregular contour, the C.I. is transitional. The sensitivity is recorded as being the mid-point (log mean) of the transitional cleaning index region (see Appendix (d)).

TABLE II. LABORATORY CONDITIONS FOR DETERMINING SENSITIVITY

Oil Distribution	Uniform Films		Discreet Globules
Surface Finish	Matte	Polished	Matte
Type of Oil			
Stearic Acid	√		
Oleic Acid	√		
Tristearin	√		
Lard Oil	√ X	√	√ X
Mineral-Lard Cutting Oil	√		
SAE 50 Motor Oil	√		
SAE 10 Motor Oil	√		
Mineral Oil	√ X	√	√ X
101 Cutting Oil	√		

√ Wetting test.
X All others.

TABLE III. SENSITIVITY OF DEGREASING EVALUATION TESTS ($g/cm^2 \times 10^7$)

Test Type		Wetting							Tracer	Chemical	
Test Name		Water-Break (Spray-Pattern)				Atomizer			Fluorescent Dye	Copper Sulfate Dip	Potass. Ferri-Cyanide Paper
Surface Finish			Matte		Polished	Matte		Polished	Matte	Matte	Matte
Surface Preparation		(a)	(b)	(c)	(b)	(b)	(c)	(b)	(a)	(a)	(a)
Oil Tested											
Type	Name										
Fatty Acid	Stearic Acid	—	1.1	2.4	—	0.16	0.27	—	—	—	—
	Oleic Acid	—	1.5	3.9	—	0.18	0.27	—	—	—	—
Fatty Ester	Tristearin	—	3.2	7.0	—	0.47	2.4	—	—	—	—
	Lard Oil	7.5	6.7	9.4	4.0	0.67	1.9	0.34	270	320	300
Medium Oils	Min.-Lard Cutting Oil	—	10.0	—	—	0.30	—	—	—	—	—
	SAE 50 Motor Oil	—	18	—	—	1.2	—	—	—	—	—
Paraffinic Oils	SAE 10 Motor Oil	—	63	—	—	3.8	—	—	—	—	—
	Mineral Oil	—	90	42	15	3.0	4.5	1.0	400	—	1,000
	101 Cutting Oil	—	100	—	—	4.3	—	—	—	—	—

Surface Preparation: (a) Benzene drying, (b) Heat tinting, (c) Passivation. See Appendix (b).
All runs made at room temperature (26°–29° C) on SAE 1010 steel surfaces.

TABLE IV. SENSITIVITY WITH MINERAL OIL—OLEIC ACID MIXTURES

Per Cent Oleic Acid (weight)	Sensitivity ($g/cm^2 \times 10^6$)	
	Atomizer	Water-Break
100.0	1.8	15
66.0	1.8	12
32.8	1.7	25
20.8	2.4	40
14.0	3.9	65
6.7	4.7	120
0.0	30	900

t: 26°–29° C. Metal: SAE 1010 steel. Finish: Matte. Preparation: Heat tinting

Fluorescent dye. Standard conditions for this test[108g] are used. If the entire circle fluoresces in the photographs, C.I. = 0; if the photographs detect no fluorescence, C.I. = 100. If a few points of fluorescence appear in the oiled circles, with the circle background being dark, C.I. is transitional. Sensitivity is recorded as in the atomizer test.

Copper sulfate dip. The test is run under standard conditions[108g]. If, both visually and with adhesion testing, the oiled circle is indistinguishable from the rest of the panel, C.I. = 100. If the entire circle shows evidence, visually, of poor plating, including spots of no plating at all, C.I. = 0. If, either visually or on adhesion testing, a few plated areas in the circle are defective, with the rest of the circle plating satisfactorily, C.I. is transitional. Sensitivity is recorded as in the atomizer test.

Potassium ferricyanide (KFC) paper. The test is run under standard conditions[108g]. If the circled area has the same blue color as the background, C.I. = 100. If the oiled circles are colorless, or lightly colored, C.I. = 0. If the circles are slightly lighter than the background in color, but not to an extent significantly greater than the normal irregularity and variation in background color, C.I. is transitional. Sensitivity is recorded as in the atomizer test.

Appendix (d) contains details on the reasons for choosing the 50 per cent, or transitional point in evaluating sensitivity rather than the point of ultimate sensitivity (C.I. curve just reaches 100), and also the reason for choosing the log mean rather than the arithmetic mean.

TABLE V. EFFECT OF EXPOSURE TIME ON SENSITIVITY OF THE FLUORESCENT DYE TEST

Time (min)	Sensitivity ($g/cm^2 \times 10^6$)
1	17
4	9.5
15	2.7
60	1.2

Oil: Lard. Surface: Matte, benzene dried, SAE 1010 steel. t: 26°—29° C.

3. Results

(a) *Conditions*

In the past, nearly all authors have determined the sensitivity of one, or sometimes more, degreasing evaluation tests for one set of conditions only. In order to provide a reasonable basis for correlating the work of different authors, including the results reported here, and to investigate more fully the factors underlying sensitivity, this series of papers presents the sensitivity of the various tests in the light of three variables: type of oil, distribution of oil, and surface finish. The runs performed on degreasing evaluation tests are shown in Table II. Oil residues present in the form of discreet globules are typical of the after-effects of alkaline cleaning. Results obtained on such surfaces were presented previously[108b]. This paper is concerned with thin, uniform oil films.

(b) *Tabulated Results*

Tables III and IV and Fig. 2 present the sensitivity results obtained from the laboratory data given in Appendix (c). Results obtained using Langmuir-Blodgett multilayers are given in Appendix (e). Comparison with drop-wise condensation phenomena is made in Appendix (f). A correlation of the results obtained here with those obtained previously in "Sequential Testing"[108b] and with the previous literature will appear in the next (and final) paper in this series on degreasing evaluation tests.

(c) *Discussion*

Inspection of Table III and Fig. 2 will show that the wetting tests are the most sensitive ones, the tracer and chemical tests being all about equal to one another, and much less sensitive than the wetting tests. Of the two wetting tests, the atomizer test is about 10–20 times more sensitive than the water-break (spray-pattern) test.

Generally speaking, the results on polished surfaces show them to be 2–3 times more sensitive than the matte surfaces. Except for the very sensitive atomizer test, the results obtained with benzene dried surfaces and those with benzene dried then heat tinted surfaces are comparable. When compared with passive surfaces, however, it is seen that these passive surfaces are generally 1.5–3 times less sensitive than all others. Since the passivating films are very thin, the poorer results obtained with the passive surfaces are surprising. The explanation may well be that a small amount of residual NaOH remains on the surface, permitting a slight amount of chemical reaction with the fatty oils. Such reaction would decrease the sensitivity of wetting tests. In connection with this proposed explanation, it is interesting to note that the effect is least pronounced in the case of mineral oil, which would not be expected to react chemically.

It can be seen that the sensitivity of all the tests decreases as the oil type changes gradually from fatty acid to paraffinic. This effect is least pronounced in the case of the fluorescent dye test. It would be expected that such a tracer test should not be affected by the type of oil the tracer is dissolved in. The poorer sensitivity of the fluorescent dye test for mineral oil than for lard oil is probably due to spreading effects for the mineral oil during the 15 minute exposure period. This is shown by the following three observations: (a) for lard oil, sensitivity is 2.7×10^{-6} g/cm², (b) for mineral oil, sensitivity is 4.0×10^{-6} g/cm² for a 15 minute exposure beginning immediately after application of the oil, (c) for mineral oil, sensitivity is 6.5×10^{-6} g/cm² for a 15 minute exposure beginning 30 minutes after application of the oil. It may be objected that there is really no limit to the sensitivity of such a tracer test, as all that needs to be done is to extend the time exposure period. However, in a previous paper[108g] it was shown that for industrial application of this test, there is an optimal exposure time, which was found to be 15 minutes for the particular conditions present in this work. Table V shows the effect of exposure time on sensitivity. Note that quadrupling the exposure time improves sensitivity by a factor of about 2.5.

Reference to a previous paper[108j] will show that the order of decreasing sensitivity of wetting tests correlates closely with the rate of oil spreading on clean surfaces (see section below for more details). Table IV shows that as the oleic acid content of an oleic acid-mineral oil mixture decreases, there is at first no change in sensitivity of wetting tests, but in time the sensitivity begins to decline gradually to the value for mineral oil. This is discussed in greater detail in the next section.

Summarizing, the atomizer test is found to be the most sensitive test studied. It is more sensitive with active materials like fatty acids and fatty oils than with paraffinic materials. The atomizer test is more sensitive on polished surfaces than on rough ones, and more sensitive on uncorroded or lightly oxided surfaces than on passive surfaces. The wetting tests in general are more sensitive than the fluorescent dye, copper sulfate dip, or potassium ferricyanide tests.

4. Theory

(a) *Water-break (spray-pattern) vs. Atomizer Tests*

In a previous publication[10i] it was stated that there are two principal explanations for the fact that the atomizer test is more sensitive than the water-break (spray-pattern) test. The two reasons were stated to be: (1) hysteresis of the contact angle, and (2) "bridging". In the experiments reported in "Sequential Testing"[10a,b,i] the oil residues were present as discreet globules, so that both of the above-named factors were of importance in determining the sensitivity of wetting tests. In the work reported here, the oil is present in the form of thin films. As none of the test surface is oil free, "bridging" of oil residues in the water-break test cannot occur. Therefore, it should be expected that only hysteresis of contact angles should account for any differences between wetting tests. The results shown in Table VI support this argument. Where both hysteresis and "bridging" are present, the atomizer test is 160–165 times more sensitive than the water-break test. Where only hysteresis is present, the atomizer test is 10–30 times more sensitive than water-break.

Table VII correlates wetting sensitivity of nine oils with the ratio of the sensitivities of the water-break and atomizer tests (i. e., a measure of the hysteresis effect). It can be seen that there is not a very marked correlation, but in general it may be said that the hysteresis effect is often greater with those oils that are less sensitive towards wetting tests. This is what would be expected. The oils that are not sensitive towards wetting tests (e. g., mineral oil) tend to be displaced from surfaces by water, so that the receding contact angle against such surfaces is exceedingly small, leading to a large hysteresis effect. Oils that are highly sensitive to wetting tests (e. g., oleic acid) are strongly adsorbed to the metal surface, and are not readily displaced by water. Thus, the receding contact angle is high in value, and the hysteresis effect is lessened.

Using standard statistical methods, it was found that the correlation given in Table VII is not statistically significant (correlation coefficient is 0.445, compared to a table value of 0.666 for the 0.05 level of significance).

(b) *Sensitivity of Wetting Tests vs. Oil Spreading Rates*

It has been mentioned above that the sensitivity of wetting tests towards various oils is related to the tenacity with which the oil is bound to the surface, as is the oil spreading rate[10j]. The correlation between wetting sensitivity and oil spreading rate will now be considered in greater detail. Table VIII tabulates the results obtained with seven oils. It will be seen that the table may be divided into three main groups: non-spreading oils, partially spreading oils, and spreading oils. As was discussed in a previous paper[10j], non-spreading oils such as oleic acid are characterized by oriented adsorption of molecules at the oil-metal interface, while spreading oils such as mineral oil do not tend to adsorb on the metal surface. In the same reference[10j] this fact was also brought out in terms of the work of adhesion, the non-spreading oils adhering strongly to metals, the spreading oils adhering only very weakly.

Considering the water-break (spray-pattern) test, then, it would be expected that the non-spreading oils which adhere strongly to the metal surface would not be readily displaced by water. Hence, the receding contact angle in this test would be relatively large, leading to good sensitivity for the water-break test. By similar reasoning, a spreading oil would tend to be displaced by water, leading to small values for the receding contact angle, and, subsequently, to poor water-break sensitivity. Table VIII bears out this reasoning, showing excellent correlation between water-break (spray-pattern) sensitivity and spreading rate.

The atomizer test, on the other hand, is dependent on advancing contact angles; that is, the angle between water and a previously (water) unwetted, oiled surface. Because of this, the question of whether or not an oil tends to be displaced by water is of less importance with the atomizer test than with the water-break test. The effect of orientation of the oil molecules can still be of importance, however. With the non-spreading oils the surface is more likely to consist of the highly hydrophobic and oleophobic $-CH_3$ groups than with spreading oils. The values given in Table VIII corroborate this analysis. With the atomizer test, the correlation with oil spreading rate is poorer than with the water-break test, and the total change in sensitivity from oleic acid to 101 cutting oil is 24 fold, while with the water-break test the total change is 67 fold.

When wetting sensitivity is plotted against spreading rate, the resulting curve is found to be non-linear. However, if the log of sensitivity is plotted vs. spreading rate, the correlation is linear. Under such conditions, standard statistical meth-

TABLE VI. EFFECT OF OIL DISTRIBUTION ON RELATIVE SENSITIVITY OF WETTING TESTS
(Matte Surfaces)

Oil	Distribution	Ratio of Sensitivities $\frac{\text{Water-Break}}{\text{Atomizer}}$
Lard	Uniform films	10.0
	Discreet globules	160
Mineral	Uniform films	30
	Discreet globules	165

TABLE VII. CORRELATION OF HYSTERESIS EFFECT WITH SENSITIVITY FOR VARIOUS OILS
(Matte Surfaces)

Oil	Sensitivity Atomizer Test ($g/cm^2 \times 10^8$)	Ratio of Sensitivities $\frac{\text{Water-Break}}{\text{Atomizer}}$
Stearic Acid	1.6	6.9
Oleic Acid	1.8	8.3
Mineral-Lard Cutting Oil	3.0	33
Tristearin	4.7	6.8
Lard Oil	6.7	10.0
SAE 50 Motor Oil	12	15
Mineral Oil	30	30
SAE 10 Motor Oil	38	17
101 Cutting Oil	43	23

TABLE VIII. CORRELATION OF OIL SPREADING RATE WITH SENSITIVITY FOR VARIOUS OILS

Oil		Sensitivity (g/cm^2)		Oil Spreading Rate*				
				Observed	Calculated from			
Type	Name	Water-Break (Spray-Pattern)	Atomizer		Water-Break	Atomizer	Average	Per Cent Error
Non-spreading Oil	Oleic Acid	1.5×10^{-7}	1.8×10^{-8}	1.00	1.14	1.53	1.34	34
Partial Spreading Oil	Lard Oil	6.7×10^{-7}	6.7×10^{-8}	2.31	2.28	2.63	2.46	6.5
	Min.-Lard Cutting Oil	1.0×10^{-6}	3.0×10^{-8}	2.88	2.59	2.00	2.30	20
	SAE 50 Motor Oil	1.8×10^{-6}	1.2×10^{-7}	2.72	3.03	3.14	3.09	14
Spreading Oil	SAE 10 Motor Oil	6.3×10^{-6}	3.8×10^{-7}	4.09	3.98	4.13	4.06	0.7
	Mineral Oil	9.0×10^{-6}	3.0×10^{-7}	4.42	4.23	3.93	4.08	7.7
	101 Cutting Oil	1.0×10^{-5}	4.3×10^{-7}	3.86	4.33	4.23	4.28	10.9

*Values are for R_9 at 150 min (103 J); that is, the ratio of the area of an oil drop 150 min after application to a metal surface and its area 9 min after application. All values for matte surfaces at 26°—29° C.

ods may be used to assess the degree of correlation. With the water-break test, the correlation was found to be excellent (correlation coefficient is 0.970, compared to a table value of 0.754 for the 0.05 level of significance). With the atomizer test, the correlation is statistically significant, though not as marked as in the case of the water-break test (correlation coefficient is 0.895). These two results are in good agreement with the discussion made just above. Using standard methods, the equation of the regression curve was determined for both evaluation tests, and from the equation, values for spreading rates were calculated. These values appear in Table VIII and Fig. 3. Stearic acid and tristearin do not appear in the table because they are solids at room temperature.

TABLE IX. CRITERION FOR WETTING SENSITIVITY IN A HOMOLOGOUS SERIES

Oil	Sensitivity—Water-Break					
	$g/cm^2 \times 10^8$	Relative Value	$mols/cm^2 \times 10^{11}$	Relative Value	Molecular Layers	Relative Value
Stearic Acid	11	1.0	39	1.0	0.51	1.0
Oleic Acid	15	1.4	53	1.4	1.5	2.9
Tristearin	32	2.9	36	0.9	1.5	2.9
Lard Oil	67	6.1	76	1.9	5.3	10.4
	Sensitivity—Atomizer					
Stearic Acid	1.6	1.0	5.6	1.0	0.075	1.0
Oleic Acid	1.8	1.1	6.2	1.1	0.18	2.4
Tristearin	4.7	2.9	5.3	0.9	0.22	2.9
Lard Oil	6.7	4.2	7.6	1.4	0.53	7.1

(c) *Polished vs. Matte Surfaces*

According to a theory presented previously[10f], if the advancing contact angle is greater than 90°, roughness increases the value of the angle, and if less than 90°, decreases the value. In the wetting tests considered here, the limiting contact angle approaches zero, so that increasing roughness should decrease the contact angle, and hence decrease sensitivity. This is borne out in the results shown in Table III.

(d) *Determining Wetting Sensitivity in a Homologous Series*

Table IX compares the wetting sensitivity of various oils of the fatty series (stearic acid, oleic acid, tristearin, and lard oil) on the basis of mass, number of molecules, and film thickness. The film thickness of the various pure materials is based on figures given by Langmuir for monolayers[9d] (Table X). The composi-

TABLE X. SURFACE AREA COVERED BY A MONOLAYER[86]

Oil	Length of Adsorbed Molecule (cm 10^8)	Area Covered by Monolayer (cm^2/g x 10^7)
Palmitic	21.4	0.47
Stearic	23.8	0.47
Tristearin	23.7	0.47
Oleic	10.8	1.02
Triolein	11.2	1.00
Lard Oil	....	0.80*

*Calculated by the authors.

tion of the lard oil used[103d] is based on an estimate drawn from various sources (Table XI). The molecular weight of lard oil is taken as 882. It can be seen quite clearly that, with members of a chemically homologous series, *wetting is a function of the number of molecules of oil present*, rather than of the mass of oil present, or of the thickness of the oil film.

(e) *Additivity of Wetting Tests*

In Table XII, there is presented an estimate of wetting test sensitivity for lard oil based on the assumption that wetting is an additive property. (The properties of triolein are predicted from the properties of oleic acid by assuming that the relationship is the same as that which obtains between stearic acid and tristearin.) It can be seen that the check between calculated and observed values is fairly good. It is therefore safe to conclude, in the light of the experiments here reported, that wetting is an additive property, with members of a homologous chemical series.

The question now remains whether or not such is the case with mixed oils consisting of chemically dissimilar materials. A great many industrial oil formulations fall into this class. To determine the answer to this question, a series of mineral oil-oleic acid mixtures were prepared (Table IV). Assuming that wetting is an additive property for such oils, values for wetting sensitivity were calculated, as is shown in Table XIII. It can be seen that the correlation is quite poor. Further analysis of the data showed that up to a limiting oleic acid concentration the wetting sensitivity is a constant. Beyond this limiting value, the sensitivity in terms of grams of oleic acid/cm^2 is a constant, so that, as the oleic acid concentration of the oil mixture decreases, the total amount of oil required increases in order to maintain this minimal oleic acid concentration. Eventually, as the oleic acid con-

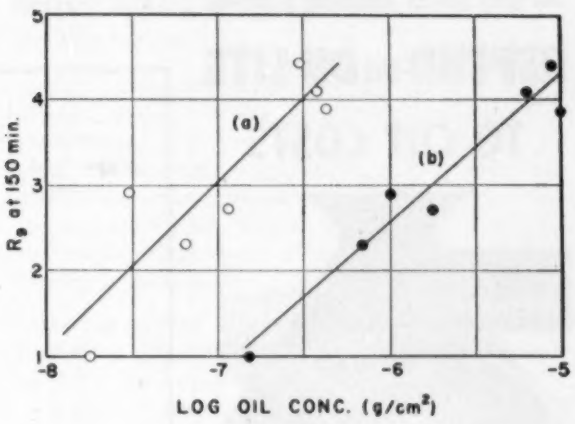

Fig. 3. Correlation of the Sensitivity of Wetting Tests with Oil Spreading Rates (a) Atomizer, (b) Water-Break

TABLE XI. COMPOSITION OF LARD OIL

Per Cent (vol.)	Reference 1	Reference 2	Reference 3	Average
Oleic Acid	50.4	65	63	67
Linoleic and Linolenic Acids	10.0	12	0	
Stearic Acid	15.0	23	31	33
Palmitic Acid	24.6		6	

1. Webb, T. E., Soap Gazette & Perfumer **28**, 302 (1926).
2. Goldschmidt, M. C. & Koffler, H., Ind. Eng. Chem. **42**, 1821 (1950).
3. Private Communication (Armour & Company).

TABLE XII. ADDITIVITY OF WETTING TESTS IN A HOMOLOGOUS SERIES

Oil	Value	Sensitivity—Water-Break: g/cm^2 x 10^8	mol/cm^2 x 10^{11}	molecular layers
Stearic Acid	Observed	11	39	0.51
Tristearin	Observed	32	36	1.5
Oleic Acid	Observed	15	53	1.5
Triolein	Calculated	44	49	4.4
Lard Oil	Observed	67	76	5.3
Lard Oil	Calculated	40	45	3.2
		Sensitivity—Atomizer		
Stearic Acid	Observed	1.6	5.6	0.075
Tristearin	Observed	4.7	5.3	0.22
Oleic Acid	Observed	1.8	6.2	0.18
Triolein	Calculated	5.3	6.0	0.53
Lard Oil	Observed	6.7	7.6	0.53
Lard Oil	Calculated	5.1	5.8	0.42

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TABLE XIII. ADDITIVITY OF WETTING TESTS WITH MINERAL OIL—OLEIC ACID MIXTURES

Per Cent Oleic Acid (weight)	Sensitivity: Observed		Additive Theory		Limiting Value Theory*	
	g/cm² x 10⁶	g oleic/cm² x 10⁶	g/cm² x 10⁶	Per Cent Error	g/cm² x 10⁶	Per Cent Error
	Atomizer Test					
100.0	1.8	1.8	...	...	...	..
66.0	1.8	1.2	2.6	44	1.8	0
32.8	1.7	0.56	4.9	188	1.8	6
20.8	2.4	0.50	7.0	192	2.4	0
14.0	3.9	0.55	8.7	123	3.6	8
6.7	4.7	0.32	14.6	211	7.5	60
0.0	30	....	....	...	...	..
	Water-Break Test					
100.0	15	15.	...	...	...	..
66.0	12	7.9	23	92	15	25
32.8	25	8.2	44	76	26	4
20.8	40	8.3	68	70	41	3
14.0	65	9.1	88	35	61	6
6.7	120	8.1	180	50	127	6
0.0	900	...	....	...	....	..
	Ratio of Sensitivities: Water-Break / Atomizer					
100.0	8.3		...	..	...	..
66.0	6.7		8.8	31	8.3	24
32.8	14.7		9.0	39	14.4	2
20.8	16.7		9.7	42	17.0	2
14.0	16.7		10.1	40	17.0	2
6.7	25.5		12.3	52	17.0	33
0.0	30		....	..	....	..

*The limiting value for oleic acid is taken as 0.5×10^{-6} g/cm² for the atomizer test, and as 8.5×10^{-6} g/cm² for the water-break test.

centration in the oil mixture decreases, a point is reached where so much oil must be added in order to maintain the minimal oleic acid concentration that the amount of mineral oil present is, in itself, sufficient to be recorded by a wetting test. The sensitivity values based on such a hypothesis appear in Table XIII, and it can be seen that the accord is very good in most cases. What this supposition means in the physical sense, then, is that up to a certain point, the non-oriented, relatively poorly detected (by wetting test) mineral oil molecule can substitute for the oriented, more readily detected oleic acid molecules, up to a certain (empirically determined) point. Beyond this point, the concentration of oriented, adsorbed oleic acid molecules on the surface is so low that mineral oil molecules can no longer replace them, so that more total oil must be present in order to be detected by wetting tests.

In view of previous observations, it might be thought better to report results in terms of mols, rather than grams. This may be so. However, the molecular weight of mineral oil is not known, so such a calculation cannot be made with great precision. Using some methods given in the literature[209-211] the authors calculated the molecular weight of the mineral oil as 430. Using this figure as a basis for calculation, it was found that on the basis of mols/cm² the same sort of conclusions may be drawn, viz., the limiting value theory presented here gives far better results than the additive theory.

(*To be Continued*)

Contribution No. 33 from the Chemical Engineering Department, Engineering Center, Columbia University, New York, N. Y.

Electroplating in Japan

(*Continued from page 487*)

Fig. 15). Open flame gas heaters are used to warm the articles slightly prior to final buffing.

Societies and Associations

The Japanese have many groups of technical and management men interested in electroplating. Their practice appears to favor the organization of many independent groups, rather than the American method of forming many branches of a national organization. The societies, as well as the universities, sponsor classes in electroplating theory and practice. Such efforts are aiding improvements in plating shop methods and equipment, as illustrated by the well-arranged plating room shown in Fig. 16. The Japanese are quick to discover their needs, and most industrious in working to improve their methods and equipment.

Acknowledgment

The author gratefully acknowledges the assistance and cooperation of Dr. Sakae Tajima, in arranging tours to many electroplating plants and in acting as interpreter. A sincere expression of appreciation is due also to the following societies and companies, whose cooperation and assistance made possible the collection of information and photographs appearing in this article:

Japanese Electroplating Society
Society of Metal Finishers
Miyata Works, Ltd.
Ohsawa Plating Shops
Seikosha Works
Nippon Kogaku K.K.
Yamato-Gumi
Tohei Plating Company
Fukui Denka
Koka Chrom
Toppan Printing Company
Nasu Aluminium Industry Company, Ltd.
Daito Kinzoku K.K.
Nihon Alumilite Company
Toyo Dento K.K.
Iwasaki Communications Manufacturing Co., Ltd.
Furukawa Electric Company
Nikko Kinzoku-Kagaku K.K.

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[2]Sakae Tajima, "Studies on the Electrolytic Polishing", The Japan Science Review 1, No. 4 (1950).

[3]Ezra A. Blount, "Bicycle Finishing in Japan", Products Finishing 16, No. 9, 88 (1952).

[4]Yoshio Koshino, "Chromium Plating at Room Temperature", Plating (Japan), No. 90 (1949).

[5]Sakae Tajima, "Recent Developments in Electrolytic Surface Treatments", J. Electrochem. Soc., Japan, 17, 279 (1949).

[6]Sakae Tajima, Metal Finishing 48, No. 6, 95 (1950).

[7]Yoshio Koshino, "Barrel Chromium Plating", Plating (Japan), No. 114 (1951).

[8]Sakae Tajima, private Communication, July, 1952.

Operating Variables

(*Continued from page 476*)

quence, in cases of this kind. An operator plating complicated shapes, however, would choose a bath where variation in tin content due to current density was small. This would insure a more uniform alloy composition over the entire surface of the work. Such factors as available current capacity, expected dragout losses and geometry of the work will all have a bearing in the selection of the solution to be used.

Having selected a solution composition best suited to a given application, it is only necessary to provide anodes of the same composition as the deposit desired, to provide equilibrium conditions in the bath. Some control measures will, of course, have to be exercised due to dragout losses, addition agent consumption, etc. In a solution where almost every variable has some influence on the alloy composition, it would be possible to adjust this composition in many ways. Experience has shown, however, that uniform results are best achieved by maintaining uniform plating conditions. This should be accomplished as far as possible by analysis of the solution. Lead-tin ratio, and total metal content may be easily maintained by use of analytical methods. Analytical methods for the addition agents used in this type of solution are time consuming and inaccurate. It is in control of the addition agent content where the coulometric method for determination of the alloy composition will prove most valuable. With the major constituents of the bath adjusted by the analysis, determination of the alloy composition will guide the operator in adjustment of the addition agent content. Where glue is used as a single addition agent, one determination may enable the operator to determine the necessary addition from the curves. Where resorcinol is used in addition to the glue, determination of the alloy composition at various current densities will indicate whether sufficient resorcinol is present. (See conclusion 4.) The electrolytic method may be carried out in small plating cells or in the tank itself. The principal requirement is that accurate methods for measurement of current, and an accurate balance for weighing of the deposit be provided. It should be remembered that values obtained by this method are average values for the total alloy plated. Where current distribution results in a large variation in local current densities the actual alloy composition at any point may differ from the average. This may be checked, however, by running the coulometric method at several current densities.

There are several possible addition agent combinations which could be used. The glue-resorcinol combination was chosen because it has been used commercially. Frequently gelatin is used in place of glue and one would expect a constant factor relationship between them.

(*To Be Continued*)

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40th Annual Convention

Final Pre-Convention Report

Convention plans have progressed to the point where all but the last minute arrangements have been completed and the whole program can be reviewed. And what a program! Every one of its many phases has been carefully planned and executed under the direction of General Chairman Sam Heiman of Philadelphia Rustproof Company.

Hotel arrangements are running smoothly; the technical program has been carefully balanced; the social program offers the old favorites and something new; the Ladies' Program is tops; and the city of Philadelphia wants to extend its welcome!

The Educational Committee, under Chairman Fred Fulforth, has arranged a program that represents an excellent balance between the practical and the academic. The theme of this program will be "What Is New in the Plating Field", and it will be highlighted by a symposium on chrome plating.

The complete program of papers and events will be outlined in detail in the June issue of PLATING.

Special Events

The Metal Finishing Suppliers' Association is sponsoring three events of major interest.

The annual business meeting and election of MFSA officers will be conducted at a special luncheon to be held on Monday, June 15.

On Monday night platers will be guests at the MFSA Open House and Supper Dance. This will truly be an evening of celebration and fun and will represent the best opportunity to "get around and see everybody".

The die-hard golfers will be pleased to hear that the MFSA Golf Outing will be on Tuesday afternoon at the Merion Golf Club. Two complete courses will be available, one for low and one for high handicap players.

National Association of Metal Finishers is holding a pre-convention business meeting and dinner on Saturday, June 13. They will also hold an open dinner session at 7:30 Wednesday.

The Outing is already the center of much talk and excitement. Plans have been completed and papers signed to give the A. E. S. exclusive use of the Wilson Line's "Delaware Belle" for a cruise on the Delaware Wednesday afternoon. There will be a catered luncheon, too!

At this writing six sights have definitely been set up for plant visitation. These include RCA and Philco in the electronic equipment field. Triangle Publications will demonstrate plating in the printing industry. The program also schedules visits to several plating shops including those at Snyder Manufacturing and Progress Manufacturing Companies.

The Ternstedt Division of General Motors (Trenton) will show their extensive shops for plating automotive parts. Buses will be available for this trip with the individual paying his own fare.

The Grand Banquet on Thursday will provide a climax for the whole convention. A superb dinner will precede the top-notch show to be emceed by the popular Mel Byron and guaranteed to contain some surprises.

The Hotel Reservations Committee reports that cooperation from all parties has been excellent but warns that this is absolutely the last call. Those who have not sent in for rooms should contact the Benjamin Franklin Hotel, Chestnut Street, Philadelphia immediately.

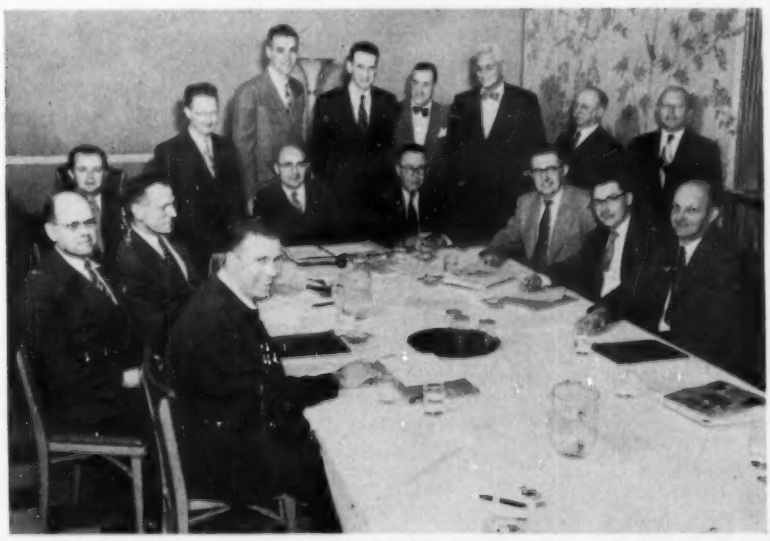
Last notice for the Ladies! It's a wonderful week ahead for everyone so be sure not to miss a moment of the fun. The program ranges from "Tea and Dolls" on Monday to the "Big Night" on Thursday, all of which will be outlined in June PLATING and the Convention Program.

Other events include the Aunt Ella luncheon at Drexelbrook Inn followed by the trip to wonderful Longwood Gardens. And then there is the cruise on the Delaware with Bingo, music and dancing.

There will be ample opportunity to window shop and browse along Chestnut and Walnut Streets where there are so many attractive shops. Here is where milady can find some smart take-home gifts.

It will be "Sunday Best" for the banquet, the social climax of the week. We'll look for you there.

The Ladies' Committee agrees that this year's affair will be the standard of excellence for conventions of the coming years!



Recent Philadelphia Convention Committee Meeting. Seated: Wilmore, Ottens, Boerckel, Rodgers, Heiman, chairman; Robson, co-chairman; Marcovitch, Foulke, Howis, Lancaster. Standing: Trusdell, Ricca, Pope, Snow, Fulforth, Hirsh, Miller, Allentown-Reading

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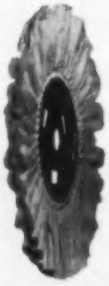

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Book Review

DR. HAROLD J. READ

Professor of Metallurgy, Pennsylvania State College

CHROMAGE, TECHNIQUE ET APPLICATIONS, by Paul Morisset, 1952, 477 pages. Editions Marval, 31 Villa D'Alésia, Paris, France.

This monograph (in French) on chromium plating is by far the most comprehensive treatise which your reviewer has seen in this subject matter field, at least so far as the practical aspects of chromium plating are concerned. Although some references are made to matters which might be classed as theoretical, such passages appear to be included, for the most part, only to clarify practical problems. The mass of material which has been culled from 243 sources in the literature has been especially well organized by Monsieur Morisset. As a result, specific information on any particular aspect of chromium plating may be readily located with the aid of a very complete table of contents and an adequate subject index.

The book is divided into four major sections. The first is labelled "Theory of the Electrolysis", but the material contained therein has a much more practical connotation than the title indicates. Actually, it is a discussion of bath variables, such as composition, conductivity, throwing power and efficiency. Only about five pages are devoted to fundamental theoretical considerations.

The second part of the volume is concerned with the techniques of chromium plating. This is full of good, meaty information, and it is a relief to find something other than the long parade of photographs of equipment diluted with desultory descriptions of machines which one finds so often in the technique section of books on electroplating. All phases of chromium deposition are covered, including decorative, porous and hard coatings.

The third, and longest, part treats of the properties of chromium deposits, both chemical and physical. Just as Part II will be of great utility to the plater, Part III provides valuable information for engineers, designers and others who make use of the deposits. A generously long chapter on the methods of measuring some of the more important properties such as hardness and thickness concludes this part of the book.

It might seem that Morisset has slighted the subject of industrial applications in the fourth part of the book, for it is comparatively short. He has, however, treated this phase of chromium plating in great detail in another monograph.

The book is beautifully printed on fine, hard-coated paper and is replete with excellent drawings, photographs and plotted data. Those who read French only occasionally, will appreciate the author's clear, simple style.

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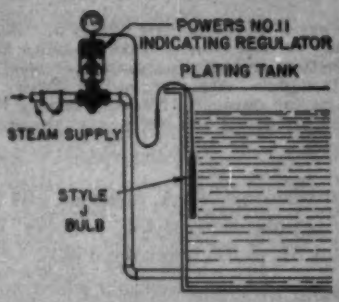

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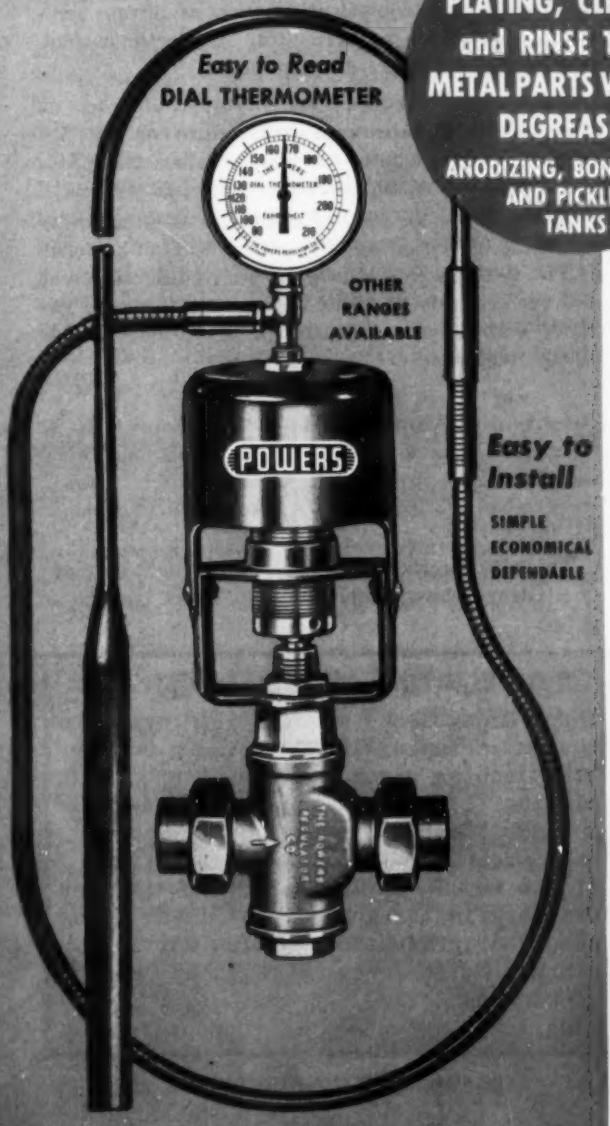

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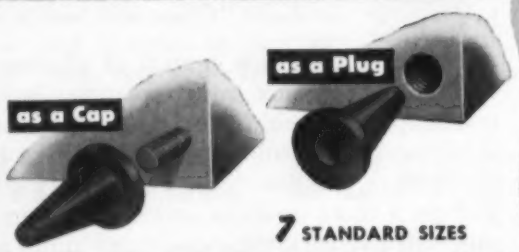

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Article Abstracts

No copies of articles are available at the offices of "Plating". Photostats may be had from libraries having files of the journal in question and offering photostat service, usually at 30-50 cents a page. Ask your public library to consult the Union List for names of libraries having the particular journal. Abbreviations used are those of Chemical Abstracts.

Bright Dip for Aluminum. W. A. Heinrich and C. B. Fideor. Patent Application 64,438, October 14, 1952. Metal Finishing **51**, p. 106 (January, 1953).

A method of bright polishing aluminum which consists in immersing the aluminum into a solution containing 4–8 per cent HNO_3, 60–75 per cent H_3PO_4, 24–36 per cent water and .005 per cent of a wetting agent comprising an alkyl aromatic sulfonate of the benzene series containing a 7–35 carbon atom in an open-chain aliphatic hydrocarbon radical while the solution is maintained at a temperature within the range of 200° F to 240° F. Comparable results are obtained when chemically equivalent amounts of nitrate salts are substituted for the nitric acid. No electric current is employed in this polishing method.

Electrolytic Polishing of Aluminum or Its Alloys. Toyoyoshi Sato. Japanese Patent 262 ('51). January 30. C. A. **46**, 10978 (November 25, 1952).

Aluminum or an alloy of aluminum as an anode is treated in a solution containing more than 50 per cent H_3PO_4, 5–10 per cent H_2SO_4, 3–5 per cent fluoride, and 2–5 per cent MeOH, with lead or stainless steel cathode with a current density of 20–80 amperes per square millimeter at 4–20 volt.

Brightening Aluminum and Aluminum Alloys. Vereinigte Aluminium Werke A. G. (Wolfgang Thury and Josef Pesl, inventors). Austrian Patent 168,882 (September 10, 1951). C. A. **46**, 10978 (November 25, 1952).

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alternate current contains H_2O_2 or H_2O_2– yielding compounds in H_3PO_4 solution. The conditions of time, temperature, and concentration are discussed and illustrated by examples.

Electroplated Alloy Coatings. E. Raub, Metalloberflaeche 7A, 17 (1953).

The principles of alloy deposition are discussed. The effect of easier passivation of electrodeposited alloys, increased hardness and the savings of expensive metals are described. Copper-zinc, cadmium-nickel, cadmium-zinc, copper-lead, silver-bismuth, gold-silver, gold-copper, gold-nickel, silver-lead, copper-lead, silver-cadmium, nickel-zinc and indium-silver alloys are discussed. Baths, operating conditions and the effect of addition agents are covered with respect to deposition potentials, alloy composition, etc. 16 references, 22 figures, 3 tables.—D. G. F.

Anodic and Chemical Brightening as Preparation for Electroplating. B. Wullhorst, Metalloberflaeche 7A, 28 (1953).

The possibility that chemical brightening or electropolishing might prove a substitute for mechanical polishing has not been fulfilled, primarily because they do not remove surface imperfections. Increased reflectivity and improved adhesion of electrodeposits can be obtained, however, current-voltage curves for brass in acid and cyanide electroplating solutions and reflection in wave-length curves are given for mechanical and anodically polished brass along with photomicrographs of mechanically and electropolished brass specimens. Chemical polishing of brass, nickel-silver, monel and aluminum in phosphoric-nitric-acetic acid solution is described. Electropolishing of 14 karat gold noted. 8 references, 10 figures.—D. G. F.

The Phenomena of Passivation on Aluminum Immersed in a Nitric Medium. Jos. Patrie. Rev. de l'Aluminium **29**, 431–437 (December, 1952).

According to the author results of a study of corrosion diagrams by methods suggested by Pourbaix and Evans may offer an explanation of the experimental phenomena related to the behavior of aluminum im-

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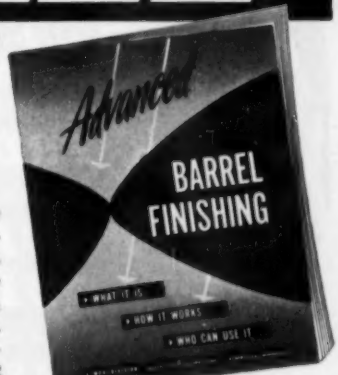

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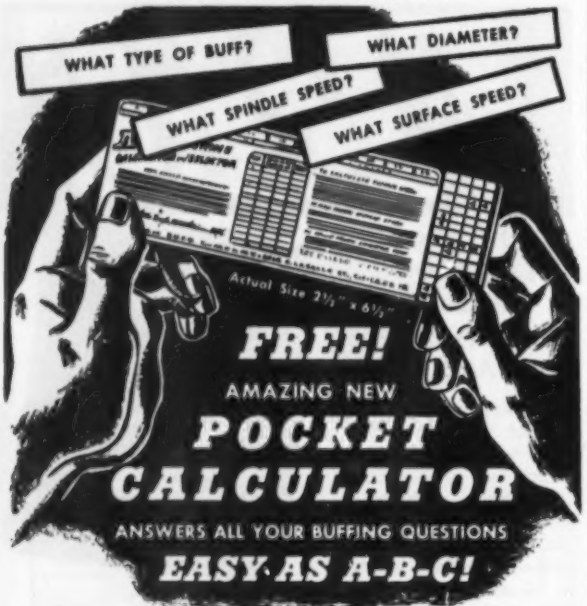

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mersed in a nitric acid medium. Optimum conditions for obtaining effective oxide coating with nitric acid are described, as well as a recently invented process for the oxidation and polishing of aluminum. This process has the peculiarity of making no use of electric current, the oxide coat forming itself on the metal just by a galvanic effect.

Coating Steel by the Aldip Process. D. K. Hanink and A. L. Noegehold. Paper presented at the S. A. E. Annual Meeting, Detroit, Mich. (January 12–16, 1953).

Aldip, a relatively new patented process for coating steel with aluminum, is described. The various operations are shown by a flow sheet, and the necessary equipment pictured, advantageous properties are pointed out, and successful applications discussed.

Aluminum Oxide Films. A. Charlesby. Atomic Energy Research Establishment Unclassified C/R 861, 40–42 (1952).

When aluminum foil is anodized at constant current in ammonium borate electrolyte, the voltage increases as the oxide-film thickness increases. As it is impossible to exceed 500–700 volts owing to electric breakdown, there is a limiting film thickness at room temperature and is independent of formation voltage up to several hundred volts. At higher temperatures smaller fields are required. Above about 200–300° C film growth can continue indefinitely at a finite rate. Mott's ideas on the oxidation in air of metals such as aluminum are applied to these anodized oxide films. In order to obtain agreement with experimental data, the author generalizes these ideas to include an electron, as well as an ion, current in the film.

Aluminum Coatings Applied to Steel by Many Methods. E. M. Smith. Materials and Methods **36**, 105–108 (December, 1952).

Aluminum coated steel combines the excellent corrosion resistance of aluminum with the strength of steel. It is not a new material, but improved methods of production have increased its availability, and its applications are steadily widening. Also, experimenta-

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Article Abstracts

tion and development continue to improve the bond and appearance of the coating and reduce the cost of production.

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An Apparatus for the Control of Anodic Coatings on Aluminum and Its Alloys. Adree Walter. Rev. de l'Aluminium **29**, 392–394 (November, 1952).

The firms Etablissements Walter and Centre Technique de l'Aluminium built an apparatus for measuring the breakdown voltage of anodic coatings. This ingenious device is featured by great speed in practical use and perfect constancy in measurement. It avoids all risk of accident which might be caused by the high tensions necessary for certain measurements.

Electrodeposition of Polyvinyl Resins. Anon., Galvano **22**, 19–20 (January, 1953).

Vinylite (polyvinyl chloride-acetate) and polyvinyl chloride were electrodeposited on a nickel anode under the following conditions:

Bath 1:

Vinylite (powder)	5	grams
Butyl acetate (as solvent)	60	ml
Tributyl citrate (as plasticizer)	1.2	ml

To this solution was added slowly with stirring the precipitant mixture of:

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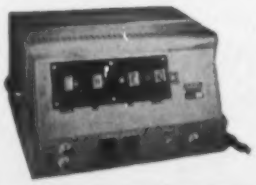

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Article Abstracts

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Bath 2:

Polyvinyl chloride (powder)	1	gram
Dioxane	40	ml
Butyl acetate	10	ml
Tributyl citrate	1.2	ml
Ethanol (absolute)	13	ml

One milliampere-hour deposited 2.15 grams of the resin.

The anonymous author found the following general rules: In order to obtain uniform, non-porous deposits the solvent (or solvent mixture) should be less volatile than the precipitant (or precipitant mixture). —Decrease of temperature increases the yield of resinous deposit.—A small amount of plasticizer improves the deposits.—Moderate agitation is required for suspensions of low stability, but excessive agitation reduces the yield of resinous deposit.—Otto Kardos.

An Electrolyte for the Electrolytic Polishing of Steel. W. Eilender and others. Metalloberflaeche **3**, 88–90 (1949).

Development of a new, promising nonexplosive electrolyte for electropolishing of steel on laboratory as well as on commercial scale. Most favorable composition of electrolyte; characteristics of electrolyte. Maximum permissible iron content of bath. Usefulness of process for commercial practice, for example, plating rooms. Suggestions in regard to stop-offs; water content of electrolyte; preliminary treatment of heavily scaled work, and oxide film on electropolished work.—Henry Brutcher.

The Testing of Anodic Coatings. Anon. Metal Industry **82**, 10 (1953).

Although British Specification 1615:1949 specifies the determination of anodic film thickness from loss of weight after stripping the coating in phosphoric acid-chromic acid solution, the French specification issued by AFNOR and Syndicat Général des Industrie Méchaniques found the method acceptable. It is claimed that measurements of the breakdown voltage constitutes the best means of indirectly evaluating the thickness of anodic coatings. The method, equipment (shown diagrammatically) voltages data and the variation due to alloy composition are discussed.

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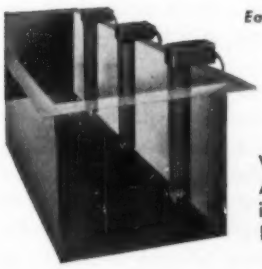

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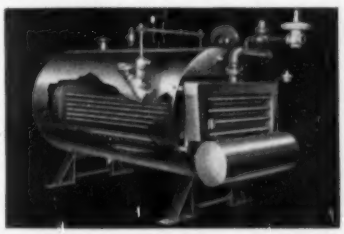

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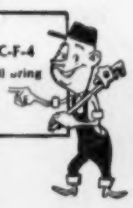

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Patent Abstracts

GEORGE B. HOGABOOM
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Copies of patents may be obtained by writing to Commissioner of Patents, Washington 25, D.C. Price 25 cents each.

No. 2,627,110, February 3, 1953—Method of Bonding Nickel Structures—John S. Hickey, Jr., Assignor to General Electric Company.

CLAIM 1. A method of bonding nickel structures which comprises placing said structures in a juxtaposition with a quantity of molybdenum adjacent the surfaces to be joined and heating said structures in a reducing atmosphere to a temperature between eutectic temperature of nickel and molybdenum and the melting point of nickel to form an alloy of the adjoining nickel and molybdenum surfaces.

3 claims.

No. 2,629,676, February 24, 1953—Corrosion Inhibitors—C. F. Prutten, assignor to the Lubrizol Corporation, Wickliffe, Ohio.

CLAIM 1. A corrosion inhibitor for metal surfaces comprising the combination of an oil-soluble organometallic phosphide, which compound has a metal substituent solely attached to phosphorus and contains at least one organic radical selected from the class consisting of hydrocarbon and halogen containing hydrocarbon radicals, and a non-aqueous oil vehicle.

9 claims.

No. 2,630,407, March 3, 1953—Electrodeposition of Chromium. Norman Hackerman, Austin, Texas, assignor to Research Corporation, New York.

The chromium film is very corrosion resistant since it generally is in the passive state. However, chromium plate does not protect the base metal from corrosion due to the presence of a crack network in the chromium plate, the cause of which has not been ascertained.

It has now been found that the crack network in electrodeposited chromium can be greatly reduced or eliminated by electrodeposition of chromium from a bath containing a salt of indium. The plated metal film produced in this way has all the advantages of chromium plate and in addition provides greatly increased protection of the base metal such as copper or steel against corrosion.

CLAIM 2. The method of electrodepositing bright, smooth, adherent films of chromium upon a cathodic workpiece which comprises immersing the cathodic workpiece in an aqueous solution of chromic acid and sulfuric acid containing from 14 to about 16 parts of indium sulfate to each 100 parts of chromic acid and

passing an electric current at a current density of from about 13 to 15.5 amp/dm² through said solution between cathodic workpiece and an anode immersed in said solution.

2 claims.

References cited: U. S. Patents 1,802,463; 2,358,029.

No. 2,632,730, March 24, 1953—Process for Electrolytically Removing Tarnish from Silver Articles. L. Brannon.

CLAIM 1. A process for cleaning silver articles by galvanic action which comprises agitating silver articles in contact with the interior of a rotating zinc drum, said drum containing a solution consisting of water, salt and soap, the said soap being insoluble and present in the form of globules, whereby tarnish is removed from said silver by galvanic action and burnished by contact with said soap globules.

CLAIM 2. . . . said drum containing an aqueous solution having the proportion of 4 tablespoons of sodium chloride and 4 tablespoons of soap to each gallon of water. . . .

CLAIM 3. . . . and agitating said articles in said solution in contact with said zinc drum.

3 claims, 4 figures.

References cited: U. S. Patents 293,528; 1,035,633; 1,068,568; 1,139,683; 1,601,511; 1,983,401.

No. 2,633,450, March 31, 1953—Tin and Tin Alloy Plating Bath. J. W. Andrews, assignor to United States Steel Corporation.

The invention relates particularly to an improved addition agent for use in acid tin or tin alloy plating baths. The new agent is a mixture containing 60 to 85 per cent of 4–4′ dihydroxy diphenyl sulfone. The mixture must be substantially free, i. e., to contain less than 1 per cent of tarry matter which is normally present as the result of by-products of the sulfonation reaction in preparation of materials. The tarry matter is especially harmful as it is mechanically occluded in the coating and interferes with solderability and imparts undesirable taste to certain food products.

Plating baths composed as follows are particularly efficient.

	Grams per liter
Phenolsulfonic acid	30–60
Sulfuric acid	30–45
Tin	30–50
Addition agent	6–12

Equally good results are obtained with fluoboric acid type electrolytes of the following composition:

	Grams per liter
Hydrofluoboric acid	45–85
Tin	20–40
Addition agent	1–4

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HERE is a new finish which not only replaces nickel, but offers advantages not found with nickel. It plates easily over steel or copper and is readily chrome plated. Followed by new Promat Chrome Sealer it offers over 200 hours resistance to red rust! It is bright out of the bath, plates at high current densities, has excellent covering power. Make-up cost is comparable to nickel, operating cost is lower. Suitable for barrel plating and semi or full automatic still tanks. And, it looks just like copper-nickel-chrome. Complete data on request — write or call today.

CR-723 *Buffing Grade* White Alloy—for parts that can be color buffed. Any shop can handle it. Ask for details.

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POOR & COMPANY

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CUTMASTER
For Long, Cool Runs On Automatic Work
WILLIAMSVILLE BUFF DIVISION
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DANIELSON CONNECTICUT
Let CUTMASTER's perfect balance, and special construction for extra coolness and service slash your automatic buffing costs. We'll rush you the details—write, wire or phone!
WILLIAMSVILLE BUFF DIVISION
The Bullard Clark Company
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A PHILADELPHIA MODERN PRODUCTION PLATING SHOP HAS OPENING FOR FOREMAN PLATER. EXCELLENT WORKING CONDITIONS.

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301 Chemsteel Building, Walnut Street, Pittsburgh 32, Pa.

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TEAR OUT AND MAIL

USE READER SERVICE CARD; INDICATE A 567.

Sulfate baths of the following composition are also very efficient:

	Grams per liter
Sulfuric acid	15–50
Tin	30–50
Addition agent	2–5

The baths are preferably operated at a temperature of 90° to 120° F. They afford an operating current density range of 25–600 amperes per square foot.

CLAIM 2. A bath for electrodeposition of tin comprising an aqueous acid solution of tin, said acid tin being selected from the group consisting of hydrofluoboric acid, phenolsulfonic acid, sulfuric acid, and mixtures of the last two named acids, and, as an addition agent, an effective amount of a mixture consisting of 60 to 85 per cent by weight 4–4′ dihydroxy diphenyl sulfone and 40–15 per cent 2–4′ dihydroxy sulfone; said effective amount being at least 2 grams per liter and not more than 1 gram per liter less than the maximum solubility of said mixture in said bath.

CLAIM 8. A bath for electrodeposition of tin-lead alloys comprising an aqueous solution of 65 to 330 grams per liter of phenolsulfonic acid, 20 to 80 grams per liter of tin and lead the ratio of tin to lead within said range adjusted to give the desired alloy composition and 5 to 25 grams per liter of an addition agent, said agent being a mixture consisting of 60 to 85 per cent by weight of 4–4′ dihydroxy diphenyl sulfone and the balance essentially 2–4′ dihydroxy diphenyl sulfone.

8 claims, 2 figures.

References cited: U. S. Patents 2,288,282; 2,313,371; 2,392,137; 2,399,194. Journal, American Chemical Society, vol. 67 (1945), pp. 238–240.

No. 2,633,452, March 31, 1953—Strainer Bags for Enclosing Electroplating Anodes. G. B. Hogaboom, Jr., and N. R. Hall.

CLAIM 1. In combination, a fabric strainer bag for enveloping an electroplating anode having a suspension hook projecting from its end, said bag having an open mouth defined by a hem, the outer wall of the bag mouth hem having openings longitudinally spaced apart a distance approximating at least half of the circumference of the bag, and a non-resilient pliantly deformable metallic member extending through the hem interior between said openings, with opposite end portions of said member respectively projecting through said respective openings exteriorly of the hem said member being adapted to be releasably bent around the shank of the anode suspension hook so as to gather the mouth of the bag about said shank above the top end of the anode, whereby to detachably secure said bag about the anode in suspended enclosing relation thereto.

2 claims, 7 figures.

References cited: U. S. Patents 678,176; 1,856,218; 1,965,040; 2,112,691.

UNICHROME
Trade Mark

News about
COATINGS for METALS
Metallic . . . . . Organic . . . . . Decorative . . . . . Protective

How to Find The Right Finish for Zinc

RECTIFIERS WITH MANY ADVANTAGES FOR PLATERS

With Unichrome Rectifiers, platers are getting the benefit of a power supply designed for them. These units have more than the usual number of selenium plates to guard against overheating. Stack assemblies "float" with no rigid connections for protection against mechanical shock. Units are delivered completely assembled to save wiring headaches. They are conservatively constructed and rated, for longer life. They're protected against corrosion. And they are available now, in many outputs that permit *close* matching to current needs, thereby avoiding expense of extra capacity.

Formula for a chromium-bright lasting zinc finish

Here's the "substitute" finish that became standard for so many products because of its quality. First, a plate of .0002" to .0005" of zinc on the product. Then a quick dipping in Unichrome *Clear Dip* Solution for brilliance and corrosion resistance. Lastly, a Unichrome Clear Enamel which seals in the brilliance despite handling and exposure.

Copper platers doing smoother, faster work

In recent months, many plants have installed the Unichrome Copper Plating Process as they got into full swing again on copper plating. When it came time to increase capacity, new tanks also got Unichrome Copper. For obvious reasons. The bath plated fast. The deposits were smooth. Buffing costs were reduced because the finish buffed *easily*, if it needed buffing *at all*. The bath contains no cyanide.

UNITED CHROMIUM, INCORPORATED
100 East 42nd St., New York 17, N. Y.
Waterbury 20, Conn. • Detroit 20, Mich.
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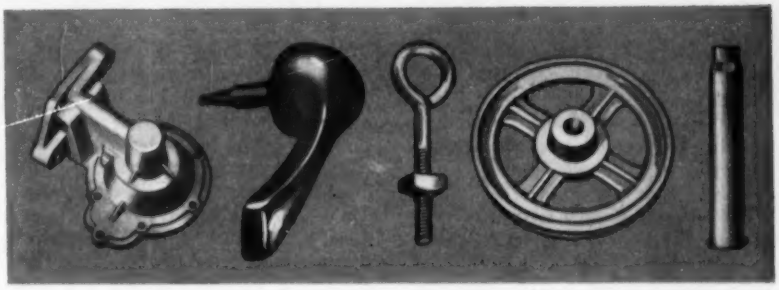
United Chromium Limited, Toronto, Ont.

Complete line of chromate treatments gives finishers greater control over type of process, color, costs and operating method



Improved chromate-treating methods have been largely responsible for the increased use of zinc as a finish in the past several years. For several reasons. They give zinc the extra protection against corrosion required by Government specifications. They can produce attractive decorative finishes. They provide a base for better adhesion of paint and lacquer.

Today, United Chromium offers metal finishers and designers the most complete line of chromate treatments available. This wide choice results in substantial benefits because it means a finish not "almost as good as" but rather the one that best meets the user's needs.

TWO WAYS TO PROCESS— DIFFERENT COLORS

By straight chemical conversion, Unichrome Dip solutions produce black, olive drab, brass-yellow, iridescent yellow or clear chromate coatings in 5 seconds to 2 minutes. The black and olive drab processes can produce finishes with the eye appeal of glossy enamel. Unichrome Dips use simple equipment, minimize installation costs.

The Anozinc* processes produce black, yellow or clear coatings *electrolytically*. These are tough, very economical finishes that can be handled while wet.

With both Anozinc and Unichrome Dip processes, the finish becomes an integral part of the zinc coating.

WHAT THE RIGHT FINISH MEANS

To a company treating zinc plated hardware, Unichrome Dip No. 95 means better "mileage" and a brighter, more corrosion resistant finish than formerly obtained.

To a plating superintendent, Unichrome Dip No. 98 means reduced costs, because he uses only half as much compound as before in make-up, and gets a solution with longer life.

To companies turning out zinc plated shell cases, Anozinc* means more economically producing a uniform, brassy protective finish inside and out. On a run of 26,000 20 mm cases, for example, one company got only 84 rejects.

To another user, Unichrome Dip 1081 —a *dry* compound—meant reduced shipping costs and fewer glass carboys to handle.

To a well known automotive supplier who replaced a "home made" chromate solution, Unichrome Dip No. 95 meant a 33% saving on materials cost alone.

In all cases, using a Unichrome process also means the service and experience of a United Chromium engineer who is often instrumental in ironing out users' operating problems.

SEND FOR SPECIFICATION CHART

A chart to save time and help locate the best-suited chromate-treating material is available. Also Bullein CC-1 describing Unichrome Dips and Anozinc. Write for your copies.

**Trade Mark*

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 568.

A.E.S. News

Australian Federal Convention

The Melbourne Branch is sponsoring an Australian Federal Convention of the three Australian Branches on May 18–20 at the Hotel Federal in Melbourne. Dr. William Blum is representing the A. E. S. Supreme Society and a total of eleven papers are scheduled in three sessions including a series of papers on "Electroplating Control". A plant visitation to General Motors-Holden Ltd. is planned and a meeting of the combined Branch Committees.

Sustaining Members

Two of the newer Branches of the Society, Dallas-Fort Worth and Wichita, have reported additions to the continually growing ranks of sustaining members.

The newly reported organizations whose dues go to the support of A. E. S. Research are: B & B Manufacturers, Inc., of Dallas Tex., and Continental Can Company, Inc., of Coffeyville, Kans.

Wichita and Kansas City Receive Permanent Charters

On March 24 Dr. George P. Swift, First Vice-President of the A. E. S., presented a permanent charter to the Wichita Branch. Twenty-five members attended the dinner prior to the meeting and this number increased to 30 for the regular meeting at which Dr. Swift spoke about the A. E. S.

Two days later, March 26, Dr. Swift repeated the performance at Kansas City. Forty members attended the pre-meeting dinner and the total attendance for the meeting was 45.

Dr. Swift on his return was enthusiastic with respect to the activity and interest being shown by these, the forty-seventh and forty-eighth branches of the A. E. S.

Library Acquisitions

Mr. Edward Gann, Jr., has donated a number of books to the A. E. S. Library from his father's collection. Many members remember Eddie Gann, Sr., who for a number of years was a familiar figure in a host of plating shops. Most prized of the books received is a bound volume of *The Metal Industry* for the year 1909, the year of the formation of the **National Electroplaters' Association of the United States and Canada**, which gives the history of the beginnings of the A.E.S.

Included also in this collection are a number of old *Electrochemical Society Transactions*, MONTHLY REVIEWS and *Metal Cleaning and Finishing* (including the first number) as well as an old W. Canning & Company catalog of considerable historical interest.

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Barrel Nickel Plating

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Increase Production —
easy to control . . . cuts down on trouble that entails costly delays.

Save time —
can be operated at a higher speed.

Reduce Rejects —
gives unbelievable uniformity of deposit in recesses . . . brighter, whiter color.

Write for **FREE** *bulletin revealing tricks on improving your nickel plating and cutting costs.*

TRUE BRITE CHEMICAL PRODUCTS CO.
P. O. Box 31, Oakville, Conn.

Branch News

BALTIMORE-WASHINGTON BRANCH

On March 10, a meeting was held at the National Bureau of Standards, Washington, D. C.

The following slate of officers was proposed and unanimously elected:

President—VINCEN J. HUGHES
Vice-President—ASAF A. BENDERLY
Secretary—CARL H. THIEDE
Treasurer—WILLIAM METZGER, JR.
Librarian—TILLMAN J. GRESSITT

and inducted into office by A. E. S. PAST PRESIDENT KEN HUSTON

The program for the evening consisted of a session intended to benefit the users of electroplating. FIELDING OGBURN presented a brief outline of the subject of electroplating. This was followed by the placing of plating questions before a "panel of experts". The questions were devised by the audience which largely consisted of invited consumers of plating. It is believed that this experiment served to further acquaint the visitors with the subject of plating and yielded some authoritative answers to their problems in this field, and, at the same time, enabled the mer ber platers to improve their service to all.

BRIDGEPORT BRANCH

On February 26, the Branch sponsored Annual Old Timers' Nite, held at the Viking Club in Bridgeport and 70 members attended. The Smorgasbord was out of this world and many members were seen going up for "seconds" and "thirds". Liquid refreshments were much in demand and BILL EHRENCRONA, Chairman of the "nite", was forced to replenish his stock early in the evening.

A regular business meeting and educational session was held March 13 at the Hotel Barnum. Fifty members and guests were present. JOSEPH GALLAN was elected an active member of the Branch. ARTHUR MACNEIL'S proposal for the election of WILLIAM EHRENCRONA to honorary membership in the Branch was unanimously approved. Bill will be presented to the National Society as a nominee for national honorary membership, by a sponsor of national prominence. PAUL JARVI of Milford was appointed chairman of the Annual Spring Dinner-Dance.

WILLIAM INNES of MacDermid, Inc. gave an interesting talk on "Factors Governing High Speed Plating". He covered deposition of acid and cyanide copper, zinc, cadmium and nickel, and discussed necessary equipment for proper maintenance of the various solutions. GEORGE HAAS of Wyandotte Chemical Corporation was host for the evening. Refreshments were served.

BOB PARKER, *Secretary*

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Branch News

CHICAGO BRANCH

JOE ANDRUS of Croname, Inc., is the new president of Chicago Branch for 1953–1954. His election brings to him a well-deserved reward for many years of unselfish service to the purposes of the Society. He will be ably assisted in his new office by ELMER OLSON of Oakite as first vice-president, ED STANEK of Belke Manufacturing as second vice-president, and RUSS HARR of Western Electric as librarian. All the above officers were elected at the March 13 meeting.

After the election, JOE GURSKI, Ford Motor Company, presented a paper on the plating of auto parts, emphasizing important contributions made by the automotive industry to the science of electroplating. Since automobile production contributes so vastly to the American economy, it follows that quality finishing is a necessary concern for that industry. Many innovations in plating techniques were originated by the auto industry which today are accepted as standard procedures by the plating brotherhood. Joe Gurski is to be complimented for his keen insight into this aspect of plating and for bringing his knowledge and experience to the members of the Society.

CHARLIE GELDZAHLER of the Research Finance Committee announced two new members—James Plating Company and American Phenolic Corporation. Chicago Branch is on the move in this department. Watch its efforts grow!

Old timers will be saddened by the recent passing of JOE CHAPLIK of J. C. Furniture Manufacturing Company. Joe had hundreds of friends in the industry and will always be remembered for his kindness and genuine interests in the purposes for which the Society was founded. After almost forty years in the plating game, spent largely in the tubular furniture field, Joe has gone to Plater's Paradise—no nickel shortages, no solution problems—just perfection. The business which he founded will be carried on by his son, LOUIS CHAPLIK.

MARV DANIELS of Hotpoint remains in a critical condition. He is not permitted visitors, as a result of an accidental shooting which occurred last December. Marv had the misfortune of doing some shopping while a hold-up was in progress.

HAROLD FAINT, long active in A. E. S. affairs, announces his new association with the Frederic B. Stevens Company. Harold is leaving the Industrial Filter & Pump Manufacturing Company to take on his new responsibilities. Good luck, Harold.

EWELL MCCOY has hit the sawdust trail. He is now selling plating equipment for the George A. Stutz Manufacturing Company. He was formerly associated with Chrome-Rite of Chicago as plating superintendent.

JACOB HAY, one of Chicago's best known plating equipment suppliers, died on March 21 while vacationing in Florida. Deepest sympathy of the Branch is extended to the family and especially to his son, Laurie, who will now continue in the management of the business.

CINCINNATI BRANCH

The Branch held its first Educational Session and Dinner-Dance in many years on March 28 at the Sheraton-Gibson Hotel with a banner turnout. That the entire proceedings were an unqualified success was the unanimous opinion of all and a credit to the outstanding work by MESSRS. NUZUM, MILLER, LOVELESS, BLOUNT, BARRY, BUCHANAN and their various committees.

The proceedings got off to a fine start at a luncheon hosted by the Branch Officers with CLYDE KELLY, National A. E. S. 3rd Vice-President, and the various speakers as their guests. After Chairman Ray Barry opened the session putting Mr. Kelly at the helm, Cincinnati's Ezra Blount gave a most illuminating dissertation on plating in Japan—some 20 years behind methods in this country—and a brief sketch on Japanese life.

CARL F. HANSEN of The Advance Tinning Company, Chicago, followed with an excellent talk on the "Principles of Effective Job Shop Management", stressing the advantages of wage incentives and a bonus system by which the employees share in the profits.

Of particular concern to platers in the Ohio Valley at this time is waste disposal so a Symposium on Waste Treatment was most appropriate with HUDSON BIERY, Ohio Commissioner to the Ohio River Valley Water Sanitation Commission, discussing the necessity of treating waste while H. S. KLINE, Industrial Hygiene Engineer, Frigidaire Division, GMC, Dayton, talked on "Various Methods for Treating Metal Finishing Wastes". These gentlemen were then joined in a panel on waste treatment by J. E. KINNEY, Sanitary Engineer, Ohio River Valley Water Sanitation Commission, and A. M. REED of Electric Auto-Lite Company, Lockland.

A capacity crowd of over 300 persons attended the dinner in the Sheraton-Gibson Ballroom, and witnessed an outstanding floor show. Dancing and convivial fellowship concluded the day's festivities with the curtain ringing down at 1:00 A.M.

CHARLES WISE, *Secretary*

DETROIT BRANCH

PRESIDENT H. E. HEAD called the meeting to order on February 6 at 8:15 P. M. in the Hotel Statler Michigan Room with approximately 140 members and guests present. A special guest, MR. J. E. FRITTS, Ternstedt Division, GMC, Columbus, Ohio, and a Past President of the Detroit Branch, was introduced. It was announced that FRANK CLIFTON was unable to attend because of illness.

Mr. Head also reported that an old-timer, CHARLIE ELDRIDGE, passed away on October 10, 1952 and gave a brief summary of Eldridge's life in the plating industry.

Head announced that the placement service as covered by the By-Laws is handled by the Secretary-Treasurer. Anyone desiring the assistance of this service should contact the Secretary-Treasurer by letter.

Two new members were unanimously elected into the branch.

Committee reports follow:

Membership—CHAIRMAN LES BORCHERT said membership at present is above the 500 mark and that everyone should consider themselves a part of the committee to keep membership at its present high level.

Nominations—CHAIRMAN CLEVE NIXON read the list of nominees for Branch Offices which were selected and approved by the committee. Nixon announced that Mr. Head was not re-nominated for President at his own request. Mr. Head thanked the committee for their work after Nixon's report and dissolved the committee.

Head also announced that a report on the Interim Meeting in Columbus, Ohio was to be made at the next meeting.

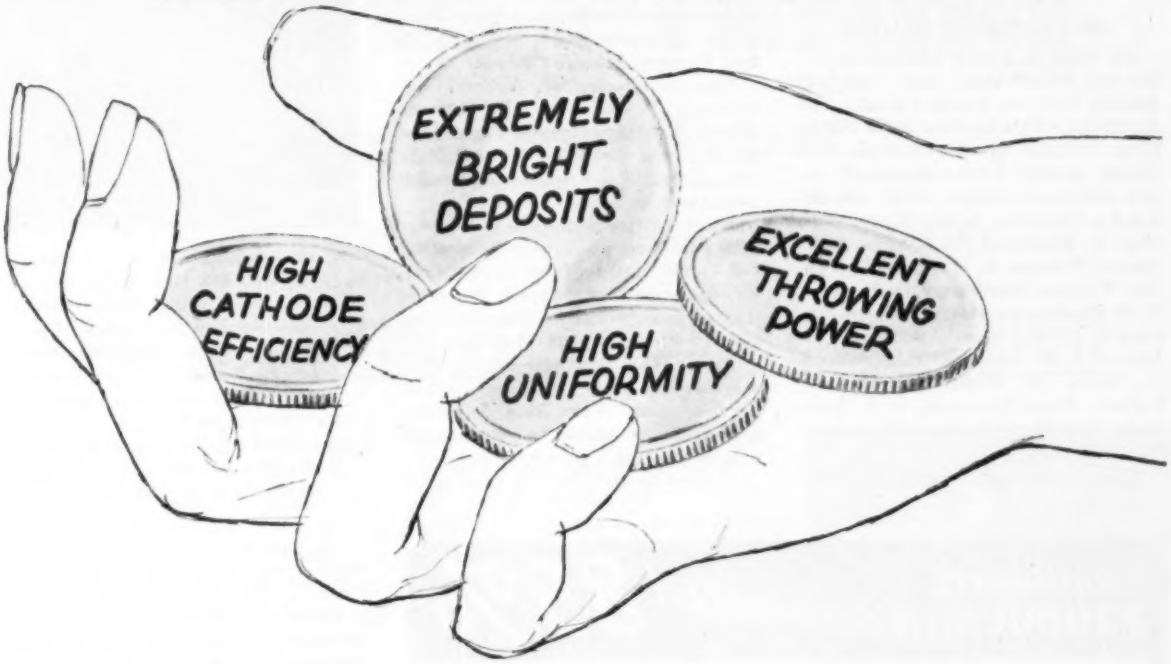
GENE JARVIS substituted for EDUCATIONAL CHAIRMAN FRED OLMSTEAD who was called away unexpectedly. After the showing of a color movie, "Unfinished Rainbows" which depicted the history of the Aluminum Company of America, Mr. Jarvis introduced R. L. DAVIDSON, Vice-President of the Gray-i-Flow Corporation, the principal speaker for the evening.

Mr. Davidson explained the principles of barrel finishing, using a large diagram for illustrations. He explained equipment, finishing media, barrel finishing compounds, and procedures at length and gave many helpful production tips which were eagerly grasped by those engaged in barrel finishing production.

Typical barrel finished parts were exhibited and methods used to obtain the finishes were described. Samples of chips and chemical compounds also were available for inspection and study by those interested. Mr. Davidson said that large barrels give best results. A barrel of 36 to 40 inches in diameter is large enough to give good barrel finishing and not too large as to be unwieldy. It is also necessary to select chips of the proper hardness for the particular job requirements. Steel, for example, requires different chips than non-ferrous metals. Another requirement is proper chemical compounds which must be formulated to produce optimum results with a specified chip and metal. Compounds are important to prevent glazing of chips and to impart the required degree of brightness to the metal surface.

E. J. KUBIS, *Publicity Chairman*

Get extra dividends from your cadmium plating



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"CADALYTE" BRIGHTENER maintains the high covering power of the bath at its peak . . . assures brilliance and uniformity of deposits. It may be added separately or with sodium cyanide in "Cadalyte" Maintenance Compound.

We can supply your cadmium anode requirements from conveniently located stock points in 11 principal cities. For complete information—including practical plating advice and descriptive literature on Du Pont plating chemicals—contact our nearest district office, or send in the coupon below.

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Branch News

GRAND RAPIDS BRANCH

The fifteenth Annual Educational Session and Dinner-Dance Party was held January 24 at the Pantlind Hotel. The day started with a luncheon in the Mocha Room attended by officers of the local branch, speakers for the educational session and many members of the editorial board of PLATING. Among those present were: AL KORBELAK, W. F. CARR, L. B. SPERRY, WILLIAM E. BRIDGETT, W. PINNER, WILLIAM GEISSMAN, JACK HANNEY, R. O. BLACKFORD, MAURICE CALDWELL, CARL E. GREEN, KEITH YHOUSE, W. E. MOLINE, J. M. ANDRUS, R. SALTONSTALL, C. NIXON, D. MORSE, D. GARDNER FOULKE, FRED FULFORTH, JACK KERSHAW, KEN HAMPEL, BERT LEWIS and WALLY REED.

Approximately 200 attended the Educational Session in the Continental Room at 1:15 P. M.

Approximately 460 members and friends attended the successful dinner party, highlighted by a presentation of a "Pot" to Past President Maurice Caldwell.

After the dinner, Mr. Walter Pinner presented the Pot to Maurice Caldwell. In very fluent language Mr. Pinner cited the history of the "Order of the Pot" for past presidents and enumerated possible uses of such an honored utensil.

The floor show featured a pick-pocket comedian whom previous to the meeting, had "lifted" articles from various members in the lobby of the hotel. Several of the "robbed" persons had the Hotel Detectives searching madly for their lost articles. Their fears were allayed when the comedian gave the articles back at the floor show. FRED MAY, Entertainment Chairman, should be complimented in arranging such a good floor show.

CARL GREEN, *Publicity Chairman*

PAST PRESIDENT M. R. CALDWELL (1945) *Gets His Pot—At the Annual Dinner-Dance of the Grand Rapids Branch, January 24, "Maurie" Caldwell was presented with a handsome Pot by his Branch. He thereby becomes eligible for that exclusive organization, the "Order of the Pot". Maurie's Pot is finished in bright vermilion pattern plate with a gold handle and gold name plate, and is fur lined with mink*

Approximately 50 members attended the February 13 meeting at Finger's Restaurant. PRESIDENT JACK HANNEY read a list of candidates proposed by a nominating committee for the election of new officers at the March meeting, as follows:

President—KEITH YHOUSE
First Vice-President—CARL GREEN
Second Vice-President—BERNARD JULIEN
Treasurer—ROBERT BLACKFORD
Librarian—LYMAN SPERRY
Assistant Librarian—RUSSEL FANCHER
Secretary—JOHN DYKSTRA
Board of Managers—WALLACE REED, FRED MAY

Motion by JAKE HAGE, seconded by BOB MEECH, that the retiring president be presented a Past President's button was carried. Maurice Caldwell moved that a letter of thanks be written to CHARLES WERFT for his paper award gift of $500. A letter was read from DR. FOULKE, thanking the Branch for the $280 back payment for the years 1950–1951 and 1951–1952 to the research fund.

Three applicants accepted as new members were: MATTHEW MITCHELL, Michigan Bumper Company; F. REX MACKERCHER, P. B. Gast & Sons Company, and ROBERT W. BRISKY, Sonneborn Company.

ASSISTANT LIBRARIAN ORVEL HOXIE took charge of the educational session which opened with an excellent short color movie on the mining and manufacture of tripoli by the American Tripoli Company. Speaker for the evening, K. ROBINSON, formerly consulting Ventilation Supervisor of the Division of Industrial Health, Lansing, Mich., gave an excellent demonstration on exhaust ventilation by use of working models of various types of hoods. He was ably assisted by J. THOMAS. Robinson stressed that baf-

DEBURRING PRODUCTION *increased* 85%

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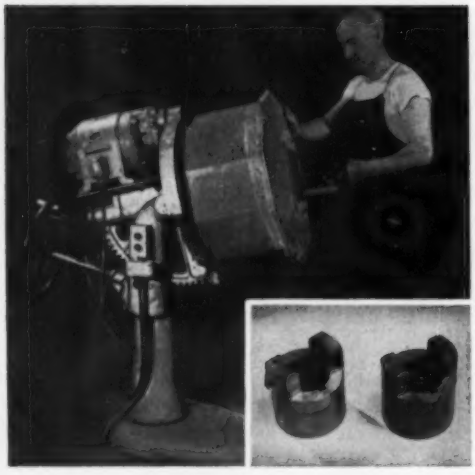
Leading Manufacturer Of Electric Lift Trucks

with

GLOBE TILTING TUMBLING BARRELS



Insulating bushings were formerly deburred with emery wheels at a rate of 300 per hour. With use of a Globe Tilting Tumbling Barrel, production was stepped up to 2000 pieces per hour. In addition to an 85% production increase, the tumbling barrel released two men for work in other departments.

Extra economies are obtained by tumbling odd shaped pieces difficult to deburr with hand wheels. With the Globe Tumbling Barrel, Baker-Raulang has doubled deburring production, and is obtaining finer finishes, using only 3 men in place of 5 men formerly required.

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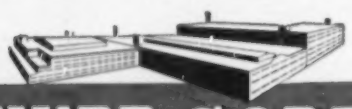
Let Globe's experimental engineering service analyze your finishing problems. Send samples of parts and completed piece to show finish desired and Globe will provide detailed finishing recommendations. Write today! No obligation, of course.



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Restrictions are off tin! Once again platers can take full advantage of the many benefits obtained through the use of Baker & Adamson's Tin Fluoborate Solution. Those who have already used it know that this versatile plating solution offers an unusual combination of advantages not available in other tin baths.

For example, the Tin Fluoborate bath is capable of operation over a wide range of current densities at room temperature or slightly above. Contrary to the general rule this *acid bath* has good throwing power, and because both anode and cathode efficiencies are about 100%, the bath is practically self-sustaining, only an occasional check of pH and specific gravity being required for control. The high stability of B&A Tin Fluoborate makes possible the formulation and use of baths with a very high metal content, a factor of great importance where extremely high plating rates are desired. In addition, deposits are fine grained, smooth and white in color.

B&A Tin Fluoborate is finding use for plating wire, electrotype shells and on parts where ease of soldering is required. In addition, it is also being used on a large commercial scale for numerous fabricated articles to provide resistance to corrosion attack by organic acids in foodstuffs and to atmospheric tarnish. The bath may be used to deposit tin directly on brass, copper or steel and has been employed in both barrel and still tank plating.

For detailed bulletins on Tin and Lead-Tin Plating from the B&A Fluoborate bath, or for further information on other B&A Fluoborate Plating Chemicals, simply fill out the coupon below, attach to your company letterhead and drop it in the mail.

B&A Tin Fluoborate Bath Speeds Preparation of Electrotype Shells

B&A Tin Fluoborate is finding growing acceptance among electrotypers for plating a thin deposit on the backs of electrotype shells preparatory to casting. Here it replaces the old-fashioned hand foiling operation and does a better job at less cost.

REAGENTS B&A STANDARD OF PURITY FINE CHEMICALS

Fluoborate Plating Chemicals—

Lead	**Cadmium**
Tin	**Indium**
Iron	**Antimony***
Copper	**Chromium***
Nickel	**Cobalt***

Fluoboric Acid

*Experimental quantities only.

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Please send me bulletins checked below:

- ☐ Tin Plating from the Fluoborate Bath (No. 749)
- ☐ Tin Plating of Electrotype Shells (No. 949)
- ☐ Lead Tin Alloy Plating from the Fluoborate Bath (No. 152)
- ☐ Lead Tin Alloy Plating in Electrotyping and other Applications (No. TS-LTE-152)
- ☐ Metal Fluoborate Solutions (outlines important applications of the various B&A Fluoborate Baths)

Name .....

Organization..... Position.....

Address .....

City..... Zone..... State.....

Major kinds of plating done .....

..... PL-5

Branch News

fles in exhaust systems can cut the amount of air required and also do a better job of ventilation. He also stated that the Division of Industrial Health, Michigan Department of Health, has a branch office in the Grand Rapids City Hall annex which will render free service in air conditioning and ventilation problems. The Division also has a twelve-minute movie available on Industrial Ventilation besides a manual on Industrial Ventilation which may be purchased for $3.00 at the following address: P. O. Box 453, Lansing, Mich.

Robinson received a hearty round of applause for his excellent talk and demonstration on ventilation.

CARL GREEN, *Publicity Chairman*

HARTFORD BRANCH

A regular meeting was held at the Bond Hotel on February 16 with 68 members and guests present. Preceding the meeting a St. Joseph Lead Company color film entitled "Lead from Mine to Metal" was shown. Following the movie MR. GEORGE HOGABOOM spoke briefly on "Latest Developments" in the plating field.

As an extra added feature the Branch heard a short talk by MR. EZRA BLOUNT, Editor of Products Finishing, on "Plating in Japan".

Guest speaker of the evening was THEODORE VOYDA, Chief Chemist, Apothecaries Hall Company, whose subject was "High Speed Brass Plating". Voyda stated that the plating of heavy deposits of brass has been encouraged by the shortage of solid brass. It has replaced solid brass on such articles as cosmetic cases, luggage hardware, etc. He discussed complete bath make-up for producing, on steel, smooth heavy deposits which may be readily buffed to a high finish. Average cathode current density of 20–30 amperes per square foot and average cathode efficiency of 80 to 85 per cent a bath temperature of 110–120° F were cited. Welded steel tanks for plating and bath filtration and purification with activated carbon were recommended.

MR. RALPH MCCAHAN was technical chairman for the evening.

STANLEY PLATOZ, *Secretary*

HOUSTON BRANCH

A Nominating Committee has selected the following candidates for 1953–1954 officer elections:

President—THURMOND GENTRY
Vice-Presidents—ED WHITMORE and JASPER DEE
Secretary-Treasurer—FOREST BASKETT
Librarian—JIM WEAVER
Board of Managers—PHIL HARRIS and HARRY MAUZY
Delegates—THURMOND GENTRY, ED WHITMORE, JIM WEAVER
Alternates—FOREST BASKETT, PHIL HARRIS, FRANK RUDMAN

INDIANAPOLIS BRANCH

Nice weather and a good program brought out 39 members and three guests for a steak dinner and meeting on February 4. SECRETARY EDNA ROHRABAUGH read the minutes of the January meeting and TREASURER ROBERT BRUCK announced that annual dues are now payable.

PRESIDENT DON PATRICK gave some information on the National Convention to be held in June in Philadelphia. ELMER LUNDBERG, Second Vice-President, announced details on Branch exhibits and prizes at the convention.

ROMAN BENDER, Educational Session and Dinner-Dance General Chairman, reported good progress on plans for the affair. This included the publicity, tickets, program, sustaining contributions, favors and arrangements.

DR. A. M. MAX, Interim Meeting Delegate, reported the East well represented among the 50 delegates present. He reported that much discussion took place on the type of articles printed in PLATING and that the need for more practical articles was stressed.

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VERSATILE AND EFFICIENT
FIDELITY ELECTRO-CLEANER NO. 626
CLEANS: Copper, Brass, Zinc, Aluminum Die Castings, and Other White Metals Prior to Plating

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SPECIALISTS IN METAL CLEANERS AND PAINT STRIPPERS
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PLATING & POLISHING PROCESSES · EQUIPMENT · SUPPLIES

This improved H-VW-M BBZ-201 is a much better, more convenient and economical bright zinc process for barrel plating. Improved . . . in its overall deposit brilliance, even in deep recesses. Improved . . . in its ease of handling because of its lower concentration. Improved . . . by a new treatment to eliminate dusting.

Your parts will not only look brighter, but they'll stay brighter longer, because BBZ-201 has a higher resistance to oxidation and tarnish. In many cases subsequent bright dipping can be eliminated. It also has an unusual tolerance for impurities – readily accepts conversion coatings – and can be soldered with relative ease. Then too, low concentration in the bath – plus low consumption—add up to real economy.

Bright zinc barrel plating with BBZ-201 is only one result of H-VW-M's constant progress for more than eighty years. It's a continuous policy, best summed up by the word Platemanship – your working guarantee of the best that industry has to offer, not only in plating processes, but in every phase of plating and polishing.

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you can PATCH or RECOAT your RACKS quickly with PC-7 Air Dry RACK COATING

In one hour — JUST ONE HOUR — you can patch your racks and have them back in service when you use

PC-7 AIR DRY RACK COATING

And it is no make-shift repair job either. PC-7 is compatible with most rack coatings and forms a close bond with them as well as the racks themselves.

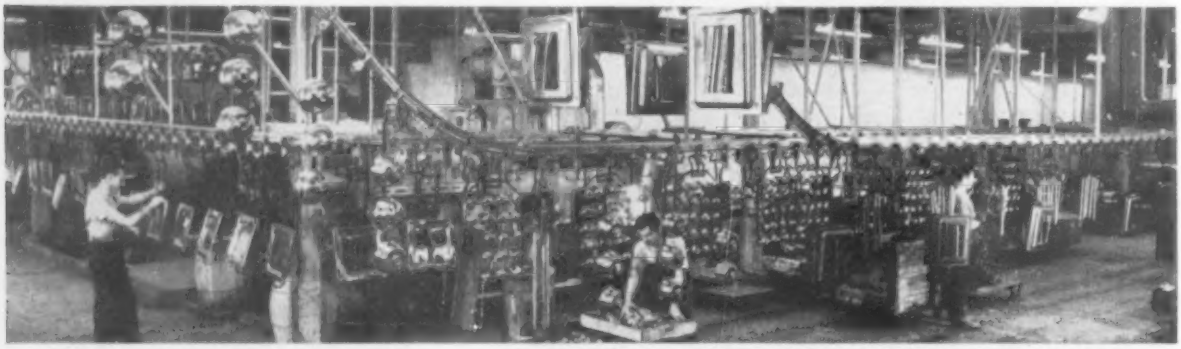
PC-7 requires no baking oven — no primer coat — nothing but a brush or a dip tank. It is AIR DRY.

PC-7 gives a uniformly thick coating on both thin wire contacts and splines.

PC-7 is ideal for use during rack development for it is easy to apply — requires no baking and can be removed by the use of a standard thinner to permit rack changes.

PC-7 has excellent chemical resistance to all plating solutions, acid pickling, etching baths, etc. Its performance has been tested in plating plants for nearly five years.

You can cut costs with PC-7 because with its high solids content it has twice the coverage of many air dry coatings.



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Branch News

JOSEPH A. DOWNEY, Elm Street, Morgantown, Ind., plating superintendent of Zenite Metal Corporation, was elected to membership.

The evening's technical program was handled by one of our own members, LEON DEERE of Naval Ordnance, who talked on "Special Finishes". Some of the special finishes discussed were aluminum anodizing, hard chromium on aluminum, black on steel, rhodium on silver plated parts. He highlighted a process of metallization of plastics for electrical conductivity with several samples of plastics plated with seven to fifteen thousandths of copper, iron, nickel or combination coatings.

Refreshments were served after the question and answer period.

EDNA ROHRABAUGH, *Secretary*

KANSAS CITY BRANCH

Twenty-six members of the Branch met at the Pickwick Hotel, 10th and McGee, for the regular monthly meeting. Dinner was served at 6:30 P. M. followed by the business meeting at 7:30 P. M.

During the business meeting, opened by PRESIDENT BRUMWELL, letters regarding the coming National Convention and the suggested improvements for PLATING were read and discussed with favorable comments. Several members indicated that they planned to attend the National Convention in Philadelphia.

Advisability of applying for a permanent charter was discussed. After a favorable vote on a motion from the floor SECRETARY OLIN K. BOCK was instructed to apply to the Supreme Society for the granting of this charter to the Kansas City Branch.

Motion was approved that the Branch have a stag party in June and discontinue the meetings during July and August.

President Brumwell presented the following names, selected by the Nominating Committee, as candidates for office for the election to be held March 26: President: MARVIN HILES, GLEN V. WILSON, LOUIS E. BARKLEY; Vice-President: CHARLES R. WILSON, HERBERT CLARK; Treasurer: WARREN ELIOT, OTTO W. JOMMERSBACH; Librarian: JOHN V. MCCANDLISH, ROBERT DETRAY; Secretary, OLIN K. BOCK.

LIBRARIAN W. A. MCGEE introduced the speaker of the evening, MR. JOE IRWIN, of the Promat Company. He presented a very informative talk on "White Brass Plating" which was followed by a question and answer session.

OLIN K. BOCK, *Secretary*

LANCASTER BRANCH

A monthly meeting was held February 13, at the Old Mill Inn, Lancaster. Thirty-one members and guests attended. LEONARD P. FOX, Chemical Engineer at the Lancaster Plant of RCA, was elected to membership.

Following the routine business, PRESIDENT FORDNEY turned the meeting over to LIBRARIAN ARTHUR ARSENAULT, who introduced the speaker, RAYMOND STRICKLEN, Research Development Engineer, Allied Research Products, Inc.

His subject was "The Chromate Treatment of Metals". He covered the fifteen-year history of chromate treatment of metals, stating that most of such treatment is done on zinc, cadmium and copper plated coatings, aluminum and magnesium alloys. He stated that a chromate film is an inorganic amorphous precipitate, a product of the reaction of the metals with chromic acid or dichromates. Due to the thinness of this film, the hardness of the metal is not affected. The protective value of the film lies in its water repellency. If the film is scratched, the soluble chromic acid or dichromates will flow and at least partly protect the exposed metal. The film does not destroy the solderability of the metal. Mr. Stricklen further stated that there is no expensive equipment necessary for application and the control of the process is fairly simple. Service tests, salt spray, and humidity tests on these films are generally conducted. Not, however, before the film is aged for twenty-four hours.

After Mr. Stricklen answered a number of questions, the meeting was adjourned. Lunch and refreshments were provided by C. E. BRUBAKER & SONS and THEO. SCHWALM.

HARRY A. SAYLOR,
Secretary-Treasurer

LOS ANGELES BRANCH

A regular meeting was called to order by PRESIDENT MYRON ORBAUGH on March 11 at Rodger Young Auditorium with about 65 members and guests present.

LIBRARIAN STUART KRENTELL introduced the speaker of the evening, K. P.

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BELLINGER, of the Chemical Corporation, whose subject was, "Conversion Coatings for Zinc, Zinc Plating and Metal Preparation".

He discussed differences between cadmium and zinc, how they protect steel by artificial action, that zinc should be avoided for high temperature applications, that cadmium is generally better for marine atmosphere and zinc for industrial locations, especially in the presence of sulfur.

The use of a 5 per cent formic acid dip on die castings has shown some advantages because of the greater flexibility in immersion times possible. He cited use of reverse current cyanide-caustic dip on steel parts prior to zinc plating and use of 5 to 6 oz/gal sodium carbonate additions to a new bath for better anode control with less danger of zinc build-up.

Preferred operating temperature on most baths is in the range of 85° to 95° F, with the higher temperatures giving better efficiency but poorer throwing power.

Bellinger ended his talk with a short discussion of impurities in zinc baths and their effect on the deposit; and the various types of conversion coatings available.

Immediately afterwards a sound-color film was shown on Fiberglas reinforced plastic tanks and chemical equipment.

EARL W. ARNOLD, *Secretary*

LOUISVILLE BRANCH

A regular meeting was held February 19 at Korfhage's Restaurant with 24 members and guests present and FIRST VICE-PRESIDENT P. H. PATE presiding.

Branch members are to be congratulated on the fine work they are doing in getting new members into the Society, having almost doubled the membership during the past year.

EDUCATIONAL CHAIRMAN STANLEY J. BEYER introduced WILLIAM LEE of the Whitemarsh Research Laboratories, Pennsylvania Salt Manufacturing Company, as the speaker of the evening. Lee, in his talk on "How Products Are Prepared and Evaluated for Market", explained the research necessary to develop a new product for the market for the public and industrial use.

Following this a General Electric movie was shown entitled, "Productivity, Key to Plenty".

Refreshments were served, courtesy of AL ENGLE and the Pennsylvania Salt Company.

J. G. STERLING, *Secretary-Treasurer*

MELBOURNE BRANCH

The eighth annual meeting of the Branch was held on February 19, 1953 at Melbourne Technical College.

Following adoption of Auditor's Report and Balance Sheet and the acceptance of seven new members, the Retiring President, HAROLD MERTON, reviewed the activities of the Branch over the past year. Membership has increased to 184, attendance at regular meetings has averaged 62, plant visits have been arranged, and in Branch Lectures, five members have given papers. A successful May Conference was held, and arrangements are in hand for May, 1953, Three-Day Federal Convention, with visit of DR. BLUM. A successful Annual Dinner was held in December, 1952. Thanks were given to various office bearers and committee members of the Branch for their untiring enthusiasm to better the Branch. Mr. Merton concluded his report by recommending that thought be given to Research Program, in conjunction with local University authorities. It would be well if portion of our per capita tax paid to Supreme Society could be allotted to the Research Program.

The election of officers for the year ending 1953, resulted as follows:

President—G. S. R. WALKER
First Vice-President—H. I. LITTAUER
Second Vice-President—J. J. DALE
Immediate Past Present—H. M. MERTON
Secretary-Treasurer—S. B. PEARCE
Librarian—H. TEAGUE
Board of Managers—R. TAYLOR, J. PARKER

S. B. PEARCE, *Secretary-Treasurer*

MILWAUKEE BRANCH

The Nominating Committee, RODNEY OLSEN, BOB STEUERNAGEL and E. ROBINSON, presented the following men for:

President—PHIL RITZENHALER, FRED ANDERSON
First Vice-President—ART NOEL, ALVIN SCHMIDT
Second Vice-President—RAY GOODSELL, HERMAN TESSMANN
Secretary-Treasurer—CLIFF PETERS, GENE PIELLUSCH
Librarian—SY BIVINS, JOHN SCHNEIDER
Board of Managers—DEXTER RHODES, E. ROBINSON

for election at the May meeting.

New members of the Branch are: HERBERT SCHULTZ, Moe Light Company; EDW. J. PAZARSKI, Cutler-Hammer, Inc., and DAVIS N. HIU, Allis-Chalmers Company.

SYLVESTER T. STROINSKI, 48, President and founder of An-Kor Plating Rack Company, passed away March 14, 1953. All members will miss Syl, for he was a grand fellow and a good member of the Milwaukee Branch.

MONTREAL BRANCH

The December meeting took place in the Mount Royal Hotel on the 2nd.

Through the courtesy of Hiram Walker Distilleries at Walkerville, Ontario, members of the Montreal Branch were shown a film entitled "Keeping Nature on Its Course". It depicted various processes in use for distilling liquor today as compared to methods used in former days.

A letter from the Montreal Tourist and Convention Bureau was read to the members. This letter dealt with reservations for an Annual Convention to be held here in either 1957 or 1958. This matter was referred to the Board of Managers for appropriate action.

J. KELLEY of the Montreal firm of Wm. J. Michaud, Ltd., was elected to membership.

JOHN T. REISENBURG, JR., *Secretary*

NEW YORK BRANCH

A meeting was called to order by PRESIDENT AMATORE on February 27. Nominations for new officers of the Branch then were proposed and MR. NADEL made a motion, that was seconded, for a meeting of the Board of Managers and President to discuss the question of the Educational Committee.

There being no other business, the meeting was turned over to P. VEIT, who conducted a question-and-answer period.

A meeting was called to order by President Amatore on March 13 at the Hotel Statler.

The following candidates were elected to membership and duly installed: D. MANLEY, H. BARDONY, S. ROSOFSKY, H. HARITON, Z. GURZENDO, A. VITONA, J. ALTER, R. BIKOLES, J. RESTINO.

The following transfer was read and accepted by the Branch: E. G. LOEFFEL (Bridgeport).

Election of new officers followed:

President—A. AMATORE
First Vice-President—A. FUSCO
Second Vice-President—D. HARTSHORN
Financial Secretary—G. COPPERMAN
Librarian—P. VEIT
Sergeant-at-Arms—I. GOLDWASSER
Secretary-Treasurer—G. SCHORE
Recording Secretary—L. LEVINSON
Board of Managers—M. MAHER
Delegates—F. MACSTOKER, A. AMATORE, G. SCHORE
Alternates—G. HERRMANN, M. NADEL, D. HARTSHORN
Educational Committee—L. DE WALTHOF, A. CARLSON, M. NADEL, G. HERRMANN, I. TAUB and D. HARTSHORN

M. Nadel made a motion and it was duly seconded that the New York Branch accept the Schaefer Proposal.

The meeting was turned over to the Librarian, P. Veit, who presented a sound color film, "Electro Painting" by the Ransburg Electro-Coating Company, which was most interesting to all.

L. LEVINSON, *Recording Secretary*

PITTSBURGH BRANCH

At the meeting held on February 12, at the Sheraton Hotel, 22 members were present for the dinner and 45 attended the main lecture.

BILL WILSON, Chairman of the Ladies' Nite Committee, reported that banquet plans have reached the finishing stage and that Saturday night, May 2, at the Shera-

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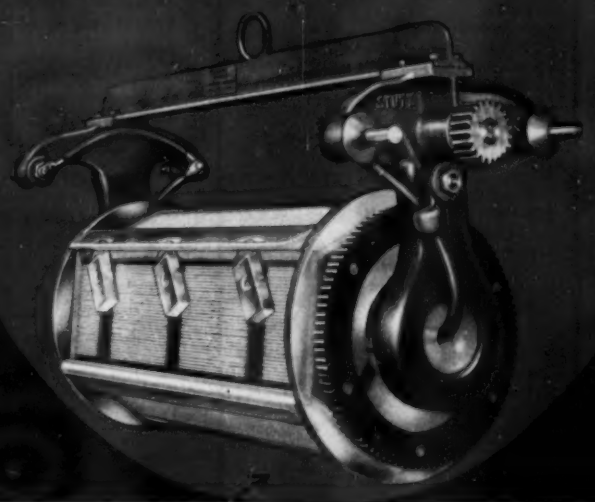
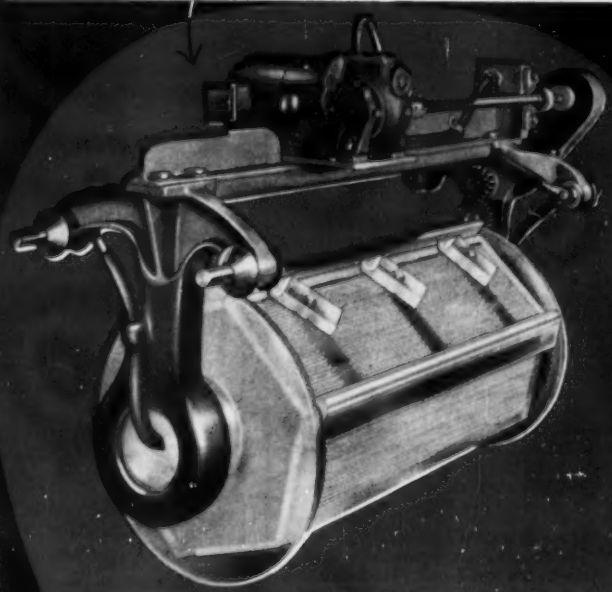
* Dual hole design in cylinder provides for handling of very small piece parts.



Tanks provide for anode rods below solution level and plating cylinders fully immersed.



For continuous rotation of cylinder from one operation to another and where minimum of solution drag-out is important. Overall length of tank is reduced since drives on tanks are eliminated. Overhead motor drive shown is gearhead totally enclosed. Roller bearing chain drive to absorb load shock.

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1—7500/3750 AMPERE, 6/12 VOLT, **MUNNING** "OPTIMUS."
1—6000/3000 AMPERE, 6/12 VOLT, **BOGUE.**
1—5000/2500 AMPERE, 8/16 VOLT, **ELECTRIC PRODUCTS,** 25° C.
1—5000/2500 AMPERE, 9/18 VOLT, **COLUMBIA.**
1—5000/2500 AMPERE, 6/12 VOLT, **EAGER.**
1—5000/2500 AMPERE, 6/12 VOLT, **CHANDEYSSON,** 25° C.
1—4000/2000 AMPERE, 6/12 VOLT, **CHANDEYSSON.**
1—3000/1500 AMPERE, 6/12 VOLT, **COLUMBIA,** Synchronous.
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1—2000/1000 AMPERE, 6/12 VOLT, **MUNNING** "OPTIMUS."

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1—4000 AMPERE, 40 VOLT, **CHANDEYSSON,** Exciter-in-head.
2—1000 AMPERE, 30 VOLT, **IDEAL,** Exciter-in-head.
1—1000 AMPERE, 40 VOLT, **CHANDEYSSON,** 25° C.
1—400 AMPERE, 40 VOLT, **M. G. C.,** Exciter-in-head.

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5—2000/1000 AMPERE, 6/12 VOLT, BRAND NEW **G. E.** COPPER OXIDE RECTIFIERS, for operation on 220/3/60. Special Price: $1,000.00 each.
1—2000 AMPERE, 6 VOLT, **G. E.** COPPER OXIDE RECTIFIER.
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1—**ALMCO** DB-8 TWO-COMPARTMENT 60" x 30" HORIZONTAL TUMBLING BARREL. Unlined, with motorized shaker and unloading pan, like new (can be lined).
1—**BELKE** 32 x 29 MODEL 5-4D TWO-COMPARTMENT (EACH COMPARTMENT 16 x 29) HORIZONTAL TUMBLING BARREL. Neoprene-lined, U. S. Vari-Drive Motor.

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Branch News

ton Hotel, should be a highly entertaining evening.

The Membership Committee was most happy to present 8 new applications for membership: ELI SHAY, Wean Engineering; LOREN W. MCOMBER, E. I. duPont de Nemours & Company; JAMES W. CONDON, DAVID MARTIN RONEY, JR., WENZEL L. BOHMAN, ROBERT E. HARROVER, JR., JAMES ROBERT CRAIN, JOSEPH R. KIRSTOFIK, all of Westinghouse Electric Corporation.

ED SMITH announced the following list of nominations for officers of the year 1953–1954:

President—ED WASHBURN
First Vice-President—BOB VARNER
Second Vice-President—G. S. WOODRUFF
Secretary—BILL WILSON
Treasurer—IRWIN SCHRAM
Librarian—MYRON CERESA
Delegates—REX GOLDBACH, R. WOOFTER, ED WASHBURN
Alternate Delegates—LESLIE LANCY, LEO SCHMITT, MYRON CERESA

Our Librarian then introduced the speaker of the evening, MR. R. O. HULL of the R. O. Hull Company, Cleveland, Ohio. He related a short history of the bright zinc plating field and elaborated further on various functions of brightness. By the use of slides, he showed a diversity of situations encountered in bright zinc plating. The fact was brought out that a rectifier current source could cause plating difficulties which are too often blamed on solution faults. The subject of power difficulties presented a rather unusual topic of discussion, and many of those present picked up valuable information from the talk.

R. H. SCHINDLER, *Secretary*

PROVIDENCE-ATTLEBORO BRANCH

A meeting was held February 16 at the Providence Engineering Hall with 33 members present.

PRESIDENT FRANK BOOTHROYD called on the Nominating Committee consisting of DR. EDWARD PARKER, JOHN HENRY and PHIL CLOMER. A list of nominations for officers, which will be sent to all members, was presented. The vote will be taken at the next meeting.

Guest speaker, FRED BREWER, research chemist, John-Manville Company, was introduced by Frank Boothroyd.

Mr. Brewer described in detail, with slide illustrations, various types of *p*H meters. Electrodes for various solutions were also discussed.

The meeting was adjourned at 10:15 P.M.

G. A. GIBBS, *Secretary*

PROVIDENCE-ATTLEBORO BRANCH

A regular meeting was held March 16 at the Providence Engineering Hall.

The following were elected officers for the coming year:

President—G. A. GIBBS
First Vice-President—S. E. KERSHAW
Second Vice-President—W. P. MATTHEW
Secretary—H. SHAVIER
Treasurer—E. SHEARSTONE
Librarian—J. A. SMITH, JR.

Speaker of the evening, HENRY STROW, True Bright Chemical Products Company, talked on the subject of "Brass Plating". He discussed brass plating solutions for various shades and the use of cyanide to control color. Importance of analysis was also stressed.

GEORGE A. GIBBS, *Secretary*

SAGINAW VALLEY BRANCH

The March meeting was held at Zehnder's Hotel in Frankenmuth on the 11th and was attended by 46 members and guests.

R. J. BRINK, Buick Motor Division; DONALD RITZEMA, Dow Chemical, and GENE ZIMMERMAN, Bay Manufacturing Company, took over the speaking duties and did an admirable job.

Brink began with a description of Buick's deionizing and chromic acid reclaiming procedure. He stated that superior results were obtained in anodizing and dichromate baths through the use of deionized water. He also described how chromic acid is removed from rinses and reclaimed as pure CrO_3 by the use of ion exchangers.

Ritzema talked on plating on magnesium, illustrating his talk with samples of plated parts. He also outlined the Dow No. 1 and No. 7 surface treatments for magnesium.

Zimmerman ended the session describing the method employed at Bay Manufacturing for vaporizing metals on plastics.

PRESIDENT L. J. MINBIOLE reported the following Branch election results:

President—M. BEN
First Vice-President—G. CARTER
Second Vice-President—R. NYQUIST
Secretary-Treasurer—S. HARGER
Recording Secretary—P. BEARDSLEY
Librarian—D. W. SNYDER
Board of Managers—L. J. MINBIOLE, Chairman; E. BRISSON, J. GASPER, D. KEELEY, A. MUEHLENBECK, D. L. SHEPPARD

Don Sheppard won the door prize donated by MR. WILLICK of Harshaw Chemical Company.

D. WM. SNYDER, *Recording Secretary*

ST. JOSEPH VALLEY BRANCH

A regular meeting was held at the Hotel Elkhart, Elkhart, Ind., on March 4.

RESEARCH

FACTS—About the AES RESEARCH PROGRAM

1. Research is vital in any technical field—the Electroplating Industry invests in research for progress and growth, and thereby maintains its competitive position.

2. Eight Research Projects are being carried on by AES and comparable effort in private industry would be up to five times as costly.

3. AES Projects have **practical** value, as well as basic technical value. For example:

   Project No. 2—"Determination of Impurities in Electroplating Solutions," has developed excellent colorimetric analytical methods which can be used in any plating shop by non-technical personnel.

   Project No. 5—"Effect and Removal of Impurities" has developed a practical solution to the problem of removal of some troublesome contaminants.

   Project No. 10—"Disposal of Plating Room Wastes," has produced what is recognized as the most comprehensive review of all the significant work done on this problem.

   Project No. 12—"Cleaning and Preparation of Metals for Electroplating" is developing fundamental data to solve a basic finishing problem, i.e. the production and evaluation of a clean surface.

   Project No. 13—on the subject of "Porosity of Plated Coatings" is seeking a correlation of data developed in Project No. 6 with new techniques in solving a problem recognized even by the layman.

   Project No. 14—"Effect of Basis Metal Condition on Plating" is following a program of study, the results of which will permit two dissimilar finishing operations to work toward a common goal.

   Project No. 15—on the subject of "Accelerated Corrosion Tests" is carrying out an approach in this field, on a scale never before conducted, to correlate conformance tests of plated ware.

4. The AES Research Program is supported entirely by Sustaining Memberships.

Yes, it's a **FACT** that the **AES RESEARCH PROGRAM** is important

—to you
—to your Company
—to the Electroplating Industry

—and that its **progress is outstanding.**

Assist your Branch Research Chairman in his efforts to obtain additional Sustaining Memberships.

• • •

I N V E S T N O W ! ! !

"YOUR BEST BET'S THE A.E.S. RESEARCH PROGRAM"

Branch News

Thirty members attended the dinner and 33, the technical session.

The following officers were elected for 1953–1954:

President—S. McDowell
First Vice-President—C. Bayman
Second Vice-President—R. Brower
Secretary-Treasurer—E. Roth
Librarian—D. Poucher
Board of Managers—H. Kraft, A. Jurgenson, L. Ragué
Delegates—H. J. Wiesner, C. McDowell, E. Brady
Alternates—W. McDowell, R. D. Wysong, E. Roth

In a ten-minute discussion period on current plating problems, the following questions were covered: How can you best strip a nickel plated part made of nickel silver base metal? What is a good method and what cleaners can be used effectively to remove scale from 4130 SAE Steel? What is an effective method outside of passivating, to prevent rust after spot welding of stainless steel?

Librarian Ralph Brower then introduced guest speaker, S. Louis Doughty, Lea Manufacturing Company, who presented a talk on "Ronal Bright Copper Process".

This bath is similar to the duPont bright copper bath. Recommended operating conditions are: temperature 140–160° F; agitation, 12–18 feet per minute; pure copper anodes; and if continuous filtration is used the bath should be circulated completely 3 to 5 times per hour.

By the use of projected slides Hull Cell test panels variations of plating results were shown. Normal bright range is between 10 and 60 asf. High free cyanide and low metal cause burning from high toward low amperage; low free cyanide and high metal cause burning from low toward high amperage. Low primary brighteners cause dull plate; low secondary brightener causes dull and hazy plate at low current density areas. Thiocyanate or sulfur impurities give dark red deep mottling in the center of panels; organic impurities cause general mottling or vertical banding in Hull Cell panels.

Eugene Roth,
Secretary-Treasurer

SOUTHEASTERN BRANCH

A regular meeting was held on March 13, at the Belmont Steak House. After a good steak supper, the meeting was called to order with 22 members and guests present, Vice-President Cyrus Shearer presiding.

The Nominating Committee offered the following slate to serve as officers for the coming year:

President—C. Shearer
First Vice-President—R. Steffey
Second Vice-President—C. Stovall
Secretary-Treasurer—W. T. Weymouth
Librarian—D. Holland

Weymouth, however, declined the nomination for business reasons and nominated C. A. Collings to take the office of Secretary-Treasurer. There being no further nominations from the floor, the Secretary was instructed to cast a unanimous vote for slate presented.

The Board of Managers this year will read as follows: M. E. Awtrey, W. T. Weymouth and E. J. Slemons.

Speaker of the evening was Dr. Belser of the Georgia School of Technology. He gave an interesting illustrated talk on applying thin coating of metal by vacuum (or sputtering).

W. T. Weymouth,
Secretary-Treasurer

SPRINGFIELD BRANCH

Though the February meeting was held on a legal holiday, February 23, 30 members were present for the dinner and regular monthly meeting at the Ivy House in West Springfield.

President Joseph Mongeau, Jr., appointed a Nominating Committee to propose a slate of officers for the annual Branch elections.

Jack Costigan gave a report on the Regional meeting to be held on May 9 at the Hotel Kimball in Springfield.

Speaker of the evening, Dr. Robert T. Foley of the General Electric Company of Pittsfield, Mass., was introduced by Librarian Roger Heroux. Dr. Foley explained the process employed in plating nickel alloys with silver and indium.

Robert J. Girard, *Secretary*

SYDNEY BRANCH

The 89th general meeting was held at

FOR TANKS AND FUME SYSTEMS

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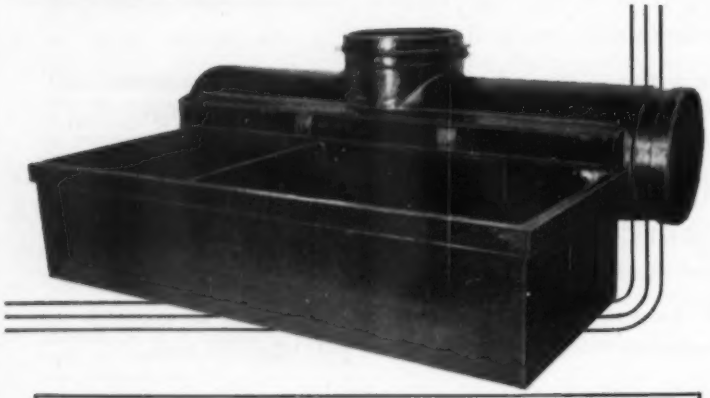

The work history of HAVEG in thousands of plants is of value to every engineer anxious to cut costs and resist corrosion: Here is a material that is economically molded into tanks, towers, valves, pipes, agers and agitators. HAVEG is not a lining or coating, and has uniform resistance to practically all acids, bases and salts, to chlorine and to many solvents and other chemicals excepting those of a highly oxidizing nature. It can be repaired and altered on the job.

Write for 64-page technical bulletin F-6. It shows tank sizes, installation and machining tips, complete chemical resistance tables. Write now! The Haveg factory is at Marshallton, Delaware (phone Wilmington 3-8884). Capacity has been increased, with deliveries improved. Why take less, when you can get proven, long-life Haveg?

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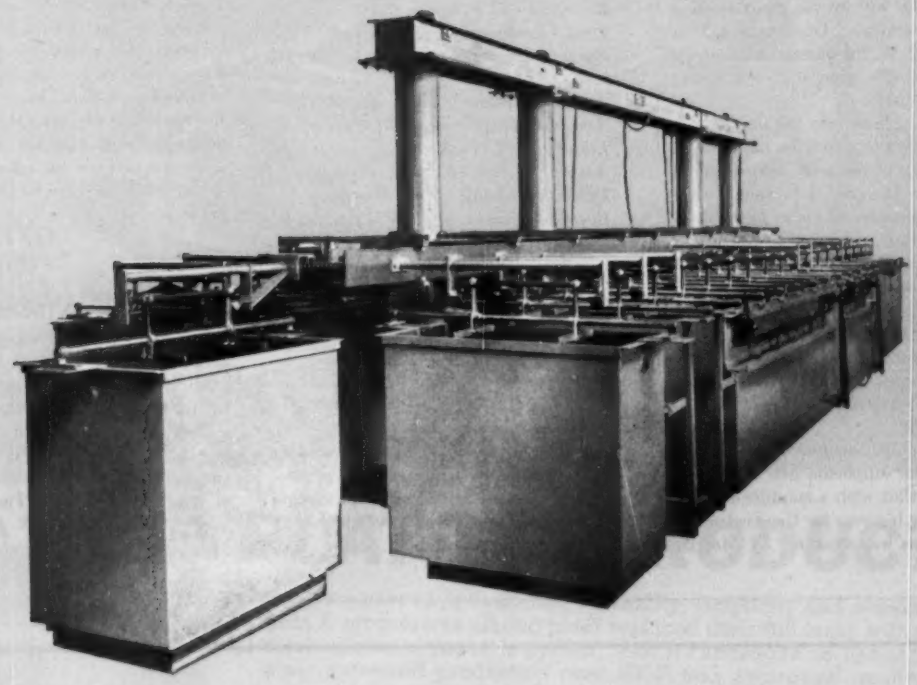

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Branch News

the Trust Building, King and Castlereagh Streets, Sydney, on February 12.

As this was the first general meeting for the year, PRESIDENT MURPHY gave his presidential address. This talk dealt with many things associated with the first Australian Convention and the visit of DR. W. BLUM, who will be the guest speaker at this Convention. Dr. Blum will be staying in N.S.W. for one month and the activities and the itinerary of his stay was also dealt with.

After looking back into the past activities of Dr. Blum in which he has been in the front ranks of research carried out in America, Mr. Murphy then spoke more on the arrangements to make Dr. Blum's stay in this State a happy and informative one. Mr. Murphy also pointed out that he wanted to thank all platers and platers' suppliers who have been so generous in their contribution of finance and general assistance during this period, and it is by their support that we will make such a huge success of this year's activities.

A vote of thanks was moved by MR. E. MERRIMAN who supported Mr. Murphy's talk and said that with a combined effort this could be a big year for the Australian Branches. This was seconded by MR. B. ARMSTRONG, our Convention Representative.

B. BRIDGEMENT,
Secretary

WATERBURY BRANCH

The following officers were elected for the fiscal year, 1953–1954, at a meeting held March 12:

President—F. T. EDDY
First Vice-President—P. SLOANE
Second Vice-President—J. V. PETROCELLI
Secretary-Treasurer—S. L. HENN
Assistant Secretary—A. W. TRACY
Librarian—T. VOYDA
Assistant Librarian—E. J. GARLAND
Publicity Director—L. J. BAKINOW
Board of Managers—E. V. COLLINS, E. W. COUCH, D. MAITLAND

Preceding the educational session a colorful and informative movie on "Metallizing and Its Practical Applications" was shown. An over-capacity attendance, attested to the interest in the paper delivered by TED VOYDA, Chief Chemist and Research Director of Apothecaries Hall Company. In his subject on "High Speed Brass Plating", Voyda pointed out the advantages of high speed brass plating using potassium salts, in producing smooth heavy deposits on steel which may be readily buffed to a high finish. The solution is more efficient than the sodium solutions and is operated at much higher current densities. Deposits are also brighter. This process is also applicable to barrel plating.

The business meeting was devoted to a discussion on the proposed changes in the *Proceedings*.

Plans were also made to prepare a Branch exhibit for the next A. E. S. Convention. The Branch exhibit prepared through the efforts of FRANCIS EDDY, PERRY SLOANE and GEORGE DUBPERNELL won first prize in Chicago. This year JOE PETROCELLI, assisted by Perry Sloane and George Dubpernell, will collaborate again to prepare an educational exhibit in an attempt to win the coveted first prize.

LEO J. BAKINOW,
Publicity Chairman

WESTERN ONTARIO BRANCH

A regular meeting was held on March 20 at the William Pitt Hotel in Chatham.

Speaker for the evening was LEO WILLICKS, Harshaw-Chemical Company, who delivered an exceptionally interesting paper on the subject of "The Influence of Operating Variables on the Composition of Electroplated Lead Tin Alloys".

K. W. FARQUHAR,
Secretary-Treasurer

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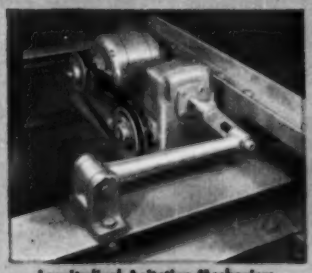
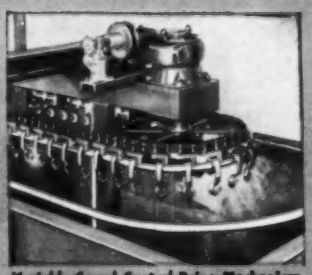
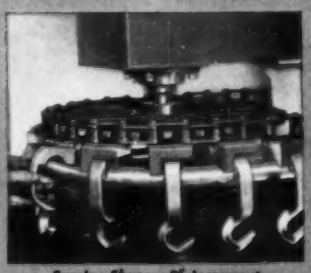


Longitudinal Agitating Mechanism

DOUBLES PLATING PRODUCTION



Variable Speed Control-Drive Mechanism



Spacing Shoes—2" Increments

Here's a new high in plating versatility, simplicity and economy of operation: A progressive plating plant replaced their still tanks with our standard semi-automatic package system; with *no increase in labor* they immediately increased production over 100% and *improved* quality. When the current long run is completed, the system will be altered for the next job by simply shifting to the desired spacing of the shoes (any dimension in 2" increments.)

There's no maintenance problem with this Wagner Semi. All wear points are Zerk lubricated; the Link-Belt roller chain is obtainable almost everywhere; the Micarta pusher blocks last indefinitely; variable speed control and drive mechanism are a unit, replaceable in minutes; the ball-bearing motor is totally enclosed, protected from drip, corrosion and moisture. The lateral agitating mechanism is mounted at one end on a single bracket and the tank is clear for loading at any point, all around. For uninterrupted plating and uniform quality, the 1⅜" anode bar radius is equidistant from the cathode at ends. The heavy sprocket shaft turns on three bearings, one outboard and two in speed reducer, for long life.

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Membership Report of the A. E. S.

Elections

ALLENTOWN-READING: George W. Bauer, Jack R. Ridge, William E. Walter, Jr.

BALTIMORE-WASHINGTON: Miss Miriam P. Sharp

BUFFALO: Joseph A. Leo, Oliver A. Short, Theodore O. Swanson

CHICAGO: Charles H. Angell, William A. Brennan, Robert L. Brown, Frank Campea, John J. Celmer, John W. Cottone, Miss Eileen G. Drews, Robert H. Fisher, James P. Hudson, Met. F. Konchan, Edwin Setlik, Joseph Studva

CINCINNATI: John E. Hoover

CLEVELAND: William F. Acks, Ralph Everstine, Allen G. Gray, George J. Hoover, Donald H. Marsh, John F. Rampe, George T. Strokes

DALLAS-FORT WORTH: James C. Cameron

DETROIT: Carl B. Anderson, Edgar D. Breedlove, Edward G. Kotcher, Donald G. Patterson, Charles T. Walker, John L. Zytell

GRAND RAPIDS: Melvin O. Bailey, Robert W. Brisky, F. Rex MacKercher, Matthew J. Mitchell, Henry Vander Wal, Jack D. Weerstra

HARTFORD: Norman Farrington

INDIANAPOLIS: John D. Cornpropst, Loren D. Stevens

KANSAS CITY: Foster E. Phenix, Henry L. Grimme, Jr., Maurice B. Flint

LANCASTER: Leonard P. Fox

MELBOURNE: Walter R. Boyd, Andrew G. Burns, Raymond W. Manderson, George E. Morgan, Leslie A. Morgan, Alfred T. Sharp, Alfred G. Villiers

MILWAUKEE: Bert G. Allen, Dawes N. Hiu, Edward J. Pozarski, Eugene F. Rinehart, Herbert L. Schultz

MONTREAL: F. G. S. Kelley

NEWARK: Arthur Bredinger, Charles A. Gerber, Horace Lawton, Arnold A. Tannenbaum

NEW HAVEN: John S. Brundage, Victor Koppel, Milton Pascal

NEW YORK: Joseph C. Albies, Jerome R. Alter, Henry L. Bardong, Richard G. Bikales, Frank Borriello, James F. Browne, Charles Campion, Leon Chaikin, Harold A. Dunleavy, Theodore Fener, Ziggie Gurzenda, Harry Hariton, Seymour Lieberman, Donald M. Manley, Louis Packman, Joseph F. Restivo, Sidney Rosofsky, George J.

Membership Competition

	Membership Apr. 1, 1952*	New Members	Net Change in Membership	Per Cent Net Change
First Group				
New York	305	60	+47½	+15.6
Milwaukee	145	24	+18½	+12.8
Toronto	132	17	+16	+12.1
Cleveland	212	36	+22	+10.4
Grand Rapids	155	23	+15	+ 9.7
Pittsburgh	132	25	+10	+ 7.6
Bridgeport	154	13	+11	+ 7.1
Newark	240	25	+ 9	+ 3.8
Los Angeles	218	18	+ 5	+ 2.3
Chicago	469	68	+10	+ 2.1
Detroit	491	45	+ 8	+ 1.6
Boston	141	5	+ 2	+ 1.4
Hartford	148	10	+ 2	+ 1.4
Philadelphia	203	24	+ 1	+ 0.5
Melbourne†	168	26	− 4	− 2.4
Second Group				
Saginaw Valley	71	21	+21	+29.6
New Haven	88	18	+18½	+21.0
Rochester	88	26	+17	+19.3
Syracuse	104	28	+18	+17.3
Montreal	72	9	+ 8	+11.1
Cincinnati	80	8	+ 7	+ 8.8
St. Louis	102	8	+ 8	+ 7.8
Indianapolis	114	12	+ 2½	+ 2.2
Buffalo‡	107	7	+ 1	+ 0.9
Waterbury	115	1	+ ½	+ 0.4
Baltimore-Washington	96	6	− 2	− 2.1
Providence-Attleboro	92	7	− 2½	− 2.7
St. Joseph Valley	74	7	− 2½	− 3.4
Dayton	81	7	− 3½	− 4.3
Sydney	86	6	− 4	− 4.7
Rockford	79	3	−15	−18.9
Third Group				
Wichita	..	20 (19)	+20	+105.3
Louisville	24	25	+23½	+ 97.9
Toledo	39	13	+17½	+ 44.9
Kansas City	...	8 (34)	+10	+ 29.4
Houston	40	14	+ 8	+ 20.0
Allentown-Reading	44	7	+ 7½	+ 17.0
Western Ontario	19	8	+ 3	+ 15.8
Hamilton	22	3	+ 3	+ 13.6
Dallas-Fort Worth§	69	16	+ 9	+ 13.0
San Francisco	67	13	+ 8	+ 11.9
Adelaide	58	6	+ 6	+ 10.3
Jackson-Lansing	59	6	+ 5	+ 8.5
Lancaster	67	7	+ 4	+ 6.0
Twin City	66	9	+ 3½	+ 5.3
Springfield	55	4	+ 2½	+ 4.5
Southeastern	47	19	+ 1½	+ 3.2
Columbus	54	7	− 1½	− 2.8
Outside Competition				
At Large	125	27	+17½	.....
In Transfer	23	..	.....	.....
Total A. E. S.	5,739	858	+393	+ 6.8
Active Membership, March 31, 1953	6,185			

*Subject to correction. †, ‡, §Winners in first, second and third group, respectively, of 1951–1952 membership competition.

Torney, Anthony J. Vivona, Walter Weisenfeld

PHILADELPHIA: John J. Berger, Lewis J. Brown, Jack I. Deitch, Henry Fenster, G. Harvey Gottschalk, William G. Hyndshaw, Vincent L. Latrechiano, Richard W. Priddis, Howard S. Roberts, John C. Shertz

PITTSBURGH: Wenzel L. Bohman, James W. Condon, James R. Crain, Robert E. Harrover, Jr., Joseph R. Kristofik, Loren W. McOmber, David M. Roney, Jr., Eli Shay

PROVIDENCE-ATTLEBORO: Joseph A. Smith, Jr.

ROCHESTER: William J. Kushner, Elmer W. Pohl, Philip Ronco, Pasquale Trimaldi

SAGINAW VALLEY: Arthur E. Franklin, Jr., L. M. Norbert, Lee P. Peck, Henry V. Pfeuffer, Preston W. Wolf

SOUTHEASTERN: Charles B. Grant, Julian E. Hix, R. G. Tuttle, Jr.

SYRACUSE: Anthony Basilone, Carl J. Byrns, Jr., Paul D. Callahan, Charles J. Garrard, Frank X. Leone, Raymond E. Lott, William O. Naylon, Donald E. Percy, Bennie A. Tisi, James A. Von Pless, Adelbert H. Walker, Robert B. Wells

TOLEDO: Joseph A. Poch, Albert Szymanowski

Reinstatements

HOUSTON: H. W. Fahrenthold

KANSAS CITY: Robert DeTray (Suspended in error)

LOS ANGELES: Ernie Hamor (Returned from Military Service)

NEWARK: Kenneth Curry

PHILADELPHIA: J. A. Munning

Transfers

Dwight Couch to Los Angeles from Baltimore-Washington; Harry Hansen to Detroit from Chicago; Harold J. La Casse from Indianapolis to Chicago; Arthur J. Gerada from Detroit to Cincinnati; William E. Trembly from Houston to Dallas-Fort Worth; Eugene P. Bottje to Grand Rapids from Detroit; Arthur J. Gerada to Cincinnati from Detroit; W. E. Brumwell from St. Louis to Kansas City; Paul A. Froeschl from St. Louis to Kansas City; F. M. Gilbert from Waterbury to Kansas City; Glen Wilson from Member-at-Large to Kansas City; B. C. Case to Chicago from Newark; Milton F. Stevenson to Syracuse from Newark; Edward G. Loeffel from Bridgeport to New York; Melvin Teets to Newark from New York; Arthur E. Krause from Chicago to Toledo; S. F. Towne to Hamilton from Toronto; H. C. Haines from New York to Waterbury

Resignations

BUFFALO: Donald Swalheim

DETROIT: John N. T. Adcock, Clifford O. Birkhold, Prof. Alfred L. Ferguson, H. J. Jameson, James E. Loranger, Raymond W. Pflug, Edmund J. Quinlan, George H. Russ, James R. Valrance, Frederick D. Wressell

HARTFORD: Anthony Gentile, Anthony Taricani, Daniel Toce

HOUSTON: W. O. Phipps

MELBOURNE: C. Bone, N. C. Davey, W. T. Fielder

NEW YORK: Nicholas Ananiatis

PITTSBURGH: Arthur K. Mock

ROCHESTER: Harold D. Barney, Clement Hilberer

WESTERN ONTARIO: Howard Oster

Suspensions

CHICAGO: D. L. Patterson

DETROIT: Grant E. Bogart

NEWARK: Donald C. Hamilton, Jr., Herbert O. Johnson

NEW YORK: J. Maisel, George S. Morrison, Abraham Neumann, George M. Rahner

SOUTHEASTERN: Sidney Grandy, M. T. Harrison, E. R. Hines, Stanley D. McGregor, Roland Melody, William Sobol, F. E. Stillwell, J. A. Tony, Joseph A. Wilkosz

Deaths

CHICAGO: Jacob Hay, Dr. O. P. Watts

HOUSTON: Nowery J. Smith

MILWAUKEE: Edward H. Meiers, Sylvester Stroinski

TORONTO: John Walker

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You'll save labor because Nankervis compound applicators are completely automatic. Costly wheel tenders' time is eliminated. You'll save on compound and buffs because just the right amount of compound is applied. And you'll cut down rejects with uniform application of buffing compound. It can add up to a savings of 40% of your buffing costs!

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A. E. S. Directory

A. E. S. OFFICERS

President.....F. J. MacSTOKER
Farrand Optical Company, Inc.
4401 Bronx Boulevard, Bronx, N. Y.

First Vice-President.....Dr. G. P. SWIFT
53 Galen Street, Watertown 72, Mass.

Second Vice-President.....Dr. R. A. SCHAEFER
Cleveland Graphite Bronze Company
17000 St. Clair Avenue, Cleveland 10, Ohio

Third Vice-President.....CLYDE KELLY
1519 Warren Boulevard, Chicago 7, Illinois

Past President.....C. F. NIXON
11-104 General Motors Research Building "A"
485 W. Milwaukee Avenue, Detroit 2, Mich.

Executive Secretary.....Dr. D. G. FOULKE
445 Broad Street, Newark 2, N. J.

A. E. S. BRANCHES (Changes only)

ADELAIDE, AUSTRALIA meets second Wednesday of each month. Address: Room 30, 17 Currie Street, Adelaide, S. A., Australia.

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CHICAGO meets second Friday of each month at 6 P. M. at Western Society of Engineers, 84 E. Randolph Street. Secretary-Treasurer, Paul Glab, 882 N. Paulina Street, Chicago 22, Ill. Research Finance Committee Chairman, Charles Geldzahler, c/o Platers' Technical Service, Inc., 509 S. Wabash Avenue, Chicago 9, Ill.

GRAND RAPIDS meets second Friday of each month at 7 P. M. for dinner; educational session at 8:15. Meeting place to be announced. Secretary, John Dykstra, 720 Delaware, S. E., Grand Rapids, Mich.

NEW YORK meets second and fourth Fridays of each month in the Statler Hotel. Secretary-Treasurer, George Schore, 150 Bennett Avenue, New York 33, N. Y. Research Finance Committee Chairman, Milton Nadel, 41-15 50th Avenue, Long Island City 4, N. Y.

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SAGINAW VALLEY meets for dinner at 6:45 P. M. and meeting at 8 P. M. at Zehnder's, Frankenmuth, Mich., second Wednesday of each month, September through May, except February. Secretary-Treasurer, Stewart Harger, 3214 Norwood Drive, Flint, Mich.

SOUTHEASTERN meets second Friday of each month at the Belmont Steak House, Atlanta, Ga. Secretary-Treasurer, Charles A. Collings, P. O. Box 1088, Atlanta, Ga.

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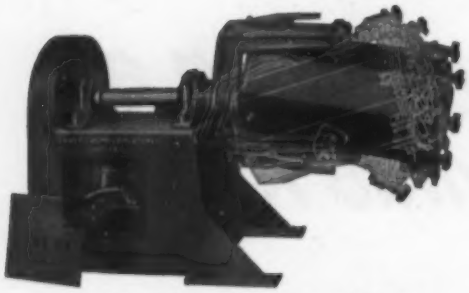

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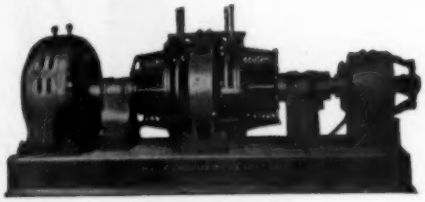

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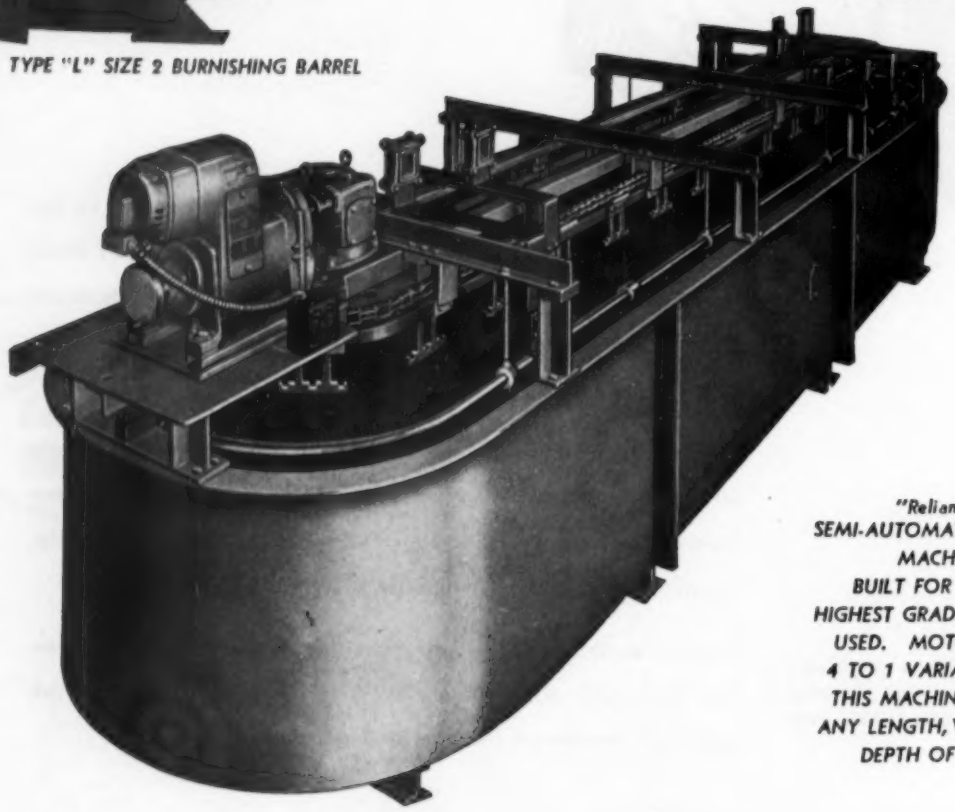

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Index to Advertisers

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Agency: Emery Advertising Corporation
ALMCO DIV., QUEEN STOVE WORKS, INC. 503
Agency: Weston-Barnett, Inc.
ALSOP ENGINEERING CORPORATION 445
AMERICAN BUFF COMPANY 504
Agency: Burlingame-Grossman, Adv.
AMERICAN CHEMICAL PAINT COMPANY 486
Agency: May Advertising Company
AMERICAN ELECTROPLATERS' SOCIETY 529
M. E. BAKER COMPANY 528
BAKER & ADAMSON PRODUCTS, GEN'L CHEM. DIV., ALLIED CHEM & DYE CORP. 519
Agency: Atherton & Currier, Inc.
BART-MESSING CORPORATION 515
Agency: Bass & Company, Inc.
BEAM-KNODEL COMPANY 536
BELKE MANUFACTURING COMPANY 433
Agency: Allbright Associates
BETTER FINISHES & COATINGS, INC. 461
Agency: James J. McMahon, Inc.
CARDINAL STEEL SUPPLY 506
CEILCOTE COMPANY 502
Agency: The Carpenter Advertising Company
THE CHEMICAL CORPORATION 503
Agency: Wm. B. Remington, Inc.
CHEMICAL PRODUCTS CORPORATION 536
Agency: Geo. T. Metcalf Company
CHEMSTEEL CONSTRUCTION COMPANY, INC. 512
Agency: Smith, Taylor & Jenkins, Inc.
CLEVELAND PROCESS COMPANY 509
Agency: Scheel Advertising
COLUMBIA ELECTRIC MANUFACTURING CO. 434
Agency: Meermans, Inc.
CROWN RHEOSTAT & SUPPLY COMPANY 531
Agency: Shrout Associates
DAVIES SUPPLY & MANUFACTURING CO. 540
Agency: Batz-Hodgson-Neuwoehner Adv. Agency
DETROIT CHEMICAL SPECIALTIES CO. 456
Agency: Sachs Studios
DUGGAN MASKING DEVICES 502
Agency: James E. Lillis Advertising Agency
DU-LITE CHEMICAL CORPORATION 496
Agency: Charles Palm & Company
DU PONT DE NEMOURS, E. I., & CO., INC. 517
Agency: Batten, Barton, Durstine & Osborn, Inc.
ENTHONE, INCORPORATED 431
Agency: Hugh H. Graham & Associates, Inc.
FEDERATED METALS DIV., AMERICAN SMELTING & REFINING CORPORATION 435
Agency: John Mather Lupton Company, Inc.
FIDELITY CHEMICAL PRODUCTS CO. 520
Agency: Art Copy Advertising Agency
FORMAX MANUFACTURING COMPANY 448
Agency: Brindley-Roth, Inc.
GENERAL ELECTRIC COMPANY 464–465
Agency: G. M. Basford Company
W. GREEN ELECTRIC COMPANY 484–485
Agency: Shappe-Wilkes, Inc.
FREDERICK GUMM CHEMICAL CO., INC. ..... 2nd Cover
Agency: Schniedenbach Studios
HANSON-VAN WINKLE-MUNNING CO. ..... 521, 4th Cover
Agency: O. S. Tyson & Company, Inc.
THE HARSHAW CHEMICAL COMPANY 468
HAVEG CORPORATION 530
Agency: Geare-Marston, Inc.
HOUGHTON LABORATORIES, INC. 446
Agency: Walker & Downing Adv.
R. O. HULL & COMPANY, INC. 437
Agency: Ralph M. French Adv.
HUPP CORPORATION 518
Agency: Howson Advertising
INDUSTRIAL FILTER & PUMP MFG. CO. 432
Agency: The Advertising Corporation
INDUSTRIAL PRODUCTS COMPANY 503
Agency: The Stewart-Jordan Company
THE IRONSIDES COMPANY 441
Agency: Mumm, Mullay & Nichols, Inc.
KOCOUR COMPANY 505
Agency: DeCasseres & Associates
KOPPERS COMPANY, INC. 459
Agency: Batten, Barton, Durstine & Osborn, Inc.
JOSEPH B. KUSHNER 502
LAND, L. J., INC. 504
THE LEA MANUFACTURING COMPANY 507
Agency: Sanger-Funnell, Inc.
CHARLES F. L'HOMMEDIEU & SONS CO. 538
MAC DERMID, INCORPORATED ..... 3rd Cover
Agency: Jackson-Hall Company
MAGNUS CHEMICAL COMPANY 444
Agency: Spooner & Kriegel
MAGNUSON PRODUCTS CORPORATION 434
Agency: Asher, Godfrey & Franklin
MANHATTAN RUBBER DIVISION 440
Agency: Roland G. E. Ullman Organization
THE MEAKER COMPANY 436
Agency: The Advertising Corporation
MICHIGAN BUFF COMPANY, INC. 508
MICHIGAN CHROME & CHEMICAL COMPANY 451
J. C. MILLER COMPANY 500
Agency: James Philip Reed
MUNRAY PRODUCTS, INC. 522
Agency: Kenneth H. Kolpien
MUTUAL CHEMICAL CO. OF AMERICA 452
Agency: The House of J. Hayden Twiss
NANKERVIS COMPANY, GEORGE L. 535
Agency: Charles M. Gray & Associates
NATIONAL RACK COMPANY 460
Agency: John Philips Advertising Company
NOBLES ENGINEERING & MFG. COMPANY 450
Agency: E. W. Sann & Associates
NORTHWEST CHEMICAL COMPANY 537
Agency: F. B. Hubert Advertising Company, Inc.
OAKITE PRODUCTS, INC. 505
Agency: Rickard & Company
PENNSYLVANIA SALT MFG. COMPANY 498
Agency: Geare-Marston, Inc.
POWERS REGULATOR COMPANY 501
Agency: Symonds, MacKenzie & Company
PROMAT DIVISION, POOR & COMPANY 510–511
Agency: Russell T. Gray, Inc.
RAMPE MANUFACTURING COMPANY 504
Agency: Kenneth H. Kolpien
RAYBESTOS-MANHATTAN, INC. 440
Agency: Roland G. E. Ullman Organization
ROTO-FINISH COMPANY 438
Agency: The Jaqua Company Adv.
SARCO COMPANY, INC. 455
Agency: Gus Binz Associates
SCHAFFNER MANUFACTURING CO., INC. 483
Agency: Edward M. Power Company, Inc.
E. E. SEELEY COMPANY, INC. 540
SELLERS ENGINEERING COMPANY 509
Agency: Simmonds & Simmonds, Inc.
SEL-REX PRECIOUS METALS, INC. 454
Agency: Boss & Company, Inc.
SETHCO 506
Agency: Harry Hurst Advertising
THE SEYMOUR MANUFACTURING CO. 462
Agency: Claude Schaffner Advertising Agency
OLIVER J. SIZELOVE COMPANY 532
SPARKLER MANUFACTURING COMPANY 447
Agency: Kreicker & Meloan, Inc.
STANDARD SUPPLY COMPANY 508
Agency: Peck Brothers Advertising
STEVENS, FREDERIC B., INC. 466
Agency: Grant Advertising, Inc.
STORTS WELDING COMPANY, INC. 452
Agency: Harold S. Card
STUTZ, GEORGE A., MFG. CO. 449, 527
Agency: Sander Rodkin Advertising Agency, Ltd.
SULPHUR PRODUCTS COMPANY, INC. 506
TITEFLEX, INC. 439
Agency: John Falkner Arndt & Company
TRUE BRITE CHEMICAL PRODUCTS CO. 514
THE UDYLITE CORPORATION 442–443
Agency: Grant Advertising, Inc.
UNIT PROCESS ASSEMBLIES, INC. 508
Agency: State Advertising Service
UNITED CHROMIUM, INCORPORATED 513
Agency: Rickard & Company, Inc.
WAGNER BROTHERS, INC. 533
Agency: Fred P. Bingham Technical Adv.
WILLIAMSVILLE BUFF DIV., BULLARD CLARK COMPANY 512
Agency: Gordon Schonfarber & Associates, Inc.
WORKLON, INC. 540
Agency: Diamond-Barnett, Inc., Adv.
WYANDOTTE CHEMICALS CORPORATION 453
Agency: Brooke, Smith, French & Dorrance, Inc.

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LANCASTER BRANCH, A. E. S., Annual Meeting at the Old Mill Inn, Lancaster, on May 8, 1953.

NEW ENGLAND REGIONAL A. E. S. Annual Meeting at the Hotel Kimball, Springfield, Mass., on May 9, 1953.

1ST FEDERAL CONVENTION for the Australian Electroplating Industry under the auspices of the Melbourne Branch, A. E. S., at the Hotel Federal, Melbourne, May 18–20, 1953.

40TH ANNUAL CONVENTION, A. E. S., at the Benjamin Franklin Hotel, Philadelphia, Pa., June 15–18, 1953.

A. S. T. M. 51ST ANNUAL MEETING at Atlantic City, N. J., June 21–25, 1953.

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